C-DOT AN-RAX (256P)

USER MANUAL

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THIS C–DOT SYSTEM PRACTICE REFERS TO THE C–DOT ACCESS NETWORK 256 PORT RURAL AUTOMATIC EXCHANGE [ABBREVIATED AS C–DOT AN-RAX (256P) IN THE REST OF THIS PUBLICATION].

THE INFORMATION IN THIS SYSTEM PRACTICE IS FOR INFORMATION PURPOSES AND IS SUBJECT TO CHANGE WITHOUT NOTICE.

A COMMENT FORM HAS BEEN INCLUDED AT THE END OF THIS PUBLICATION FOR READER'S COMMENTS. IF THE FORM HAS BEEN USED, COMMENTS MAY BE ADDRESSED TO THE DIRECTOR (SYSTEMS), CENTRE FOR DEVELOPMENT OF TELEMATICS, 39, MAIN PUSA ROAD, NEW DELHI - 110 005

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Chapter 1.

Introduction

1.1. PURPOSE AND SCOPE OF THE DOCUMENT

This document provides a general description of C-DOT AN-RAX. It also provides information regarding Software and Hardware architecture of the AN-RAX, its usage in the network; conversion of existing RAX to AN-RAX and Man Machine Interface (MMI) commands.

1.2. INTRODUCTION

The product AN-RAX is basically a Subscriber line concentrator, used for remoting.

There are three level of remoting, namely the first, second and third level, from the 'Local Exchange' (LE) (Fig.1.1).

- The 'Remote Switch Unit' (RSU) provides the functionality of first level of remoting. All the Subscribers connected to RSU can access each other and also the subscribers, in the 'National Network' (NAT-NW), through LE. RSU in this case will, perform the functionality of a complete switch (with both intra exchange and upto NAT-NW Switching). It will handle the 'Call Processing' (CP), charging and billing functionality, but would itself be a part of the LE.

  RSU can also provide concentration.

- The 'C-DOT Access Network - RAX ' (AN-RAX) will provide the second level of remoting. AN-RAX might be connected to a RSU or directly to the LE. The AN-RAX supports V5.2 protocol, and handles the functionality of second level of remoting.

  The second level of remoting has its scope and role clearly defined. At this level there would neither be any intra switching or call processing activities, nor the AN-RAX would handle the charging, billing and administration functions of subscribers.

  AN-RAX provides a transparent link between the subscriber and LE. It handles the various subscriber events, the BORSCHT functionalities. (Battery feed, Over voltage protection, Ringing, Supervision, Coding, Hybrid and Testing).

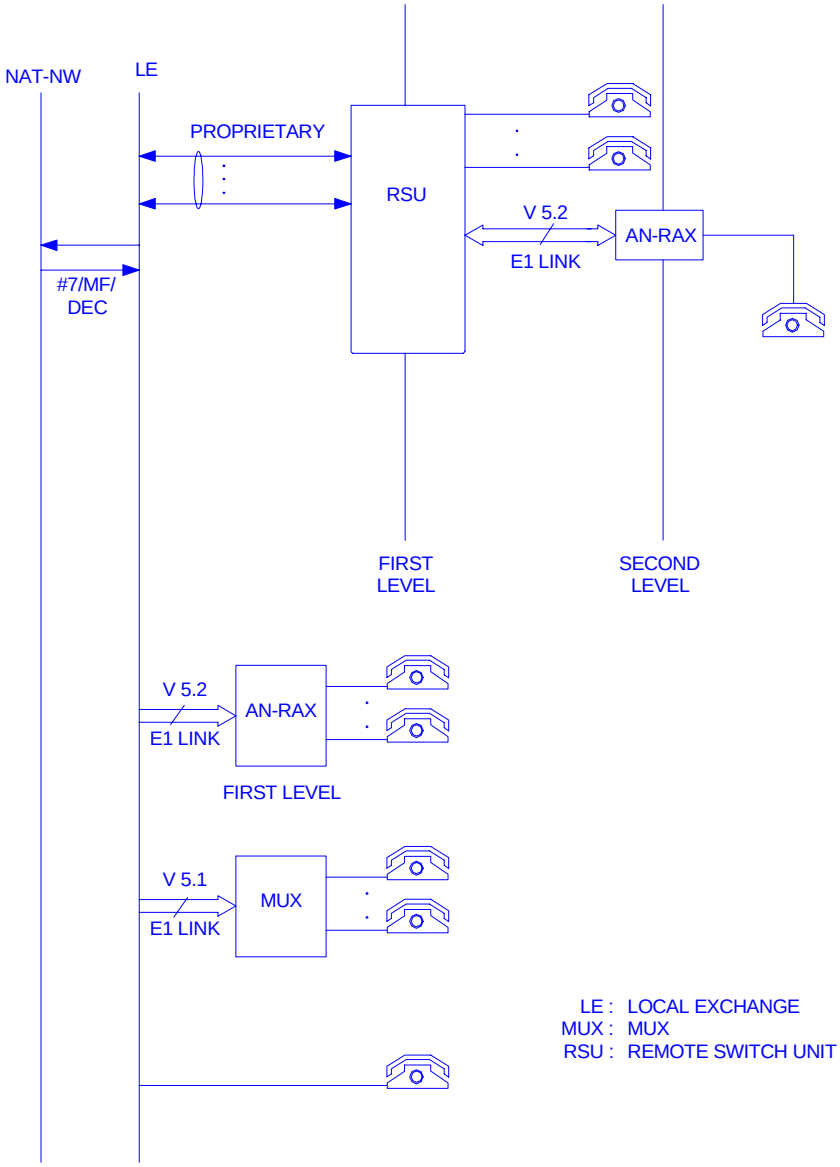

FIG. 1.1
LEVELS OF REMOTING

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All the administration, call processing, charging, billing, traffic monitoring and switching are performed at LE, where AN-RAX plays the role of front end termination at remote end.

The main feature of AN-RAX is that it provides concentration, through V 5.2 protocol, which is used as a signalling protocol between LE and AN-RAX. 248 PSTN subscribers can be supported on two E1 links towards LE, thus providing an approximate concentration of 4:1. This places the AN-RAX at a level higher than a simple MUX, which is used at third level of remoting. The system can work on one E1 link towards LE, but without 'PROTECTION', resulting in increase in concentration to 8:1 (Fig. 1.2).

- Third Level of remoting handles the front end functions (subscriber events), but does not provide any concentration. The various subscriber ports of MUX have nailed up (fixed) slots in the link towards LE. The MUX may be connected directly to LE or to an unit of a higher level of remoting.

1.3. ORGANISATION OF THE DOCUMENT

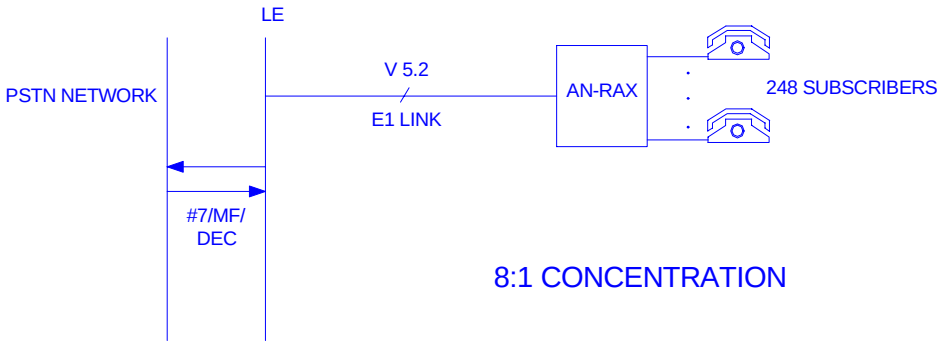
The document is organized into 8 chapters, chapter 1 gives an introduction to AN-RAX, chapter 2 deals with broad level specifications of the system. Chapters 3, 4 & 5 deal with Hardware and Software architecture of the system.

Chapter 6 provides the details about conversion & installation procedure.

Chapter 7 provides the man-machine interface (MMI) for the AN-RAX system.

Chapter 8 gives details of alarm monitoring.

At the end of document Appendix A, B & C are provided for GLOSSARY, Maintenance procedures and gives information on system startup check list of AN-RAX respectively.



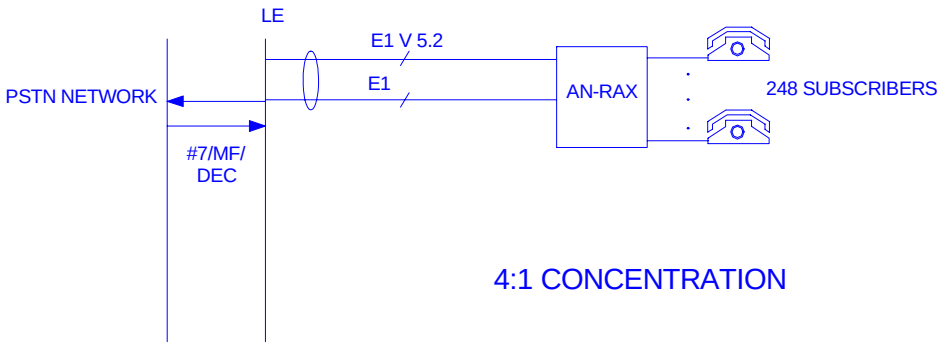


FIG. 1.2
AN-RAX CONCENTRATION

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Chapter 2.

Specifications of AN-RAX

2.1. CAPACITY

A maximum number of 60 bearer channels (2E1 Links) are supported by AN-RAX. A maximum of 248 PSTN subscribers can be supported.

2.2. INTERFACE TOWARDS LOCAL EXCHANGE

The system has a provision of two 2 Mbps digital trunks (E1 Links) for V5.2 link towards Local exchange.

2.3. INTERFACE TOWARDS SUBSCRIBERS

LCC Cards provide 2W analog line interface for subscriber. It supports Caller Identification on 2 ports of each card.

CCM Cards provide 2W analog line interface for subscriber. It supports Caller Identification Reversal and 16KHz metering pulses on 7th and 8th ports.

2.4. SIGNALLING INTERFACE TO THE EXCHANGE

V5.2 signalling interface, uses TS16 of E1 links for signalling, related to the PSTN subscribers.

This approach makes it possible to connect the AN-RAX unit to any exchange that supports V5.2 protocol.

2.5. ALARM

Each card health status is displayed at an alarm window on VDU Panel.

Separate health status for each E1 Link is displayed at an alarm window on VDU Panel.

2.6. POWERING OPTION

Power is derived from nominal -48V DC.

2.7. DIAGNOSTICS

Periodical and manual self test of the AN-RAX unit is done.

Test card is used to test the health of the analog subscriber line cards & lines (including telephone instrument).

Chapter 3.

System Architecture

3.1. OVERVIEW

The C-DOT 256P AN-RAX has been designed by reconfiguring the basic building block used in higher capacity systems of the C-DOT DSS family. The system is highly modular, and flexible to the changing technology. The software is structured and clear interfaces exist between hardware and software. The redundancy of critical circuitry and exhaustive set of diagnostic schemes ensure high system reliability.

3.2. SYSTEM HARDWARE BLOCKS (REFER FIG. 3.1 & 3.2)

All subscriber lines are interfaced to the system through the Terminal Interface cards (LCC, CCM). Each terminal interface card caters to 8 terminations. Four such cards form a Terminal Group. There are 32 such terminal interface cards; sixteen in each frame (C-DOT 256P AN-RAX has a two frame implementation. The top frame is called 'Slave Frame' and bottom frame is called 'Master Frame').

3.2.1. Terminal Group (TG)

Analog information from the terminations is first changed to digital PCM form at a bit rate of 64 Kbps. Thirty two such PCM (Pulse Code Modulation) channels from four Terminal Interface cards are time division multiplexed to generate one 32 channel, 2.048 Mbps PCM link.

Thus from 32 terminal interface cards, eight such PCM links are obtained, which are terminated on ARC (AN-RAX controller card).

3.3. SYSTEM ENGINEERING

3.3.1. Configuring

Complete hardware of AN-RAX including PDP apart from the main card assembly are all housed in AN-RAX cabinet.

AN-RAX CABINET

The distribution is as follows :

AN-RAX Controller Card (ARC)	=	2 Nos.
AN-RAX Interface Card (ARI)	=	2 Nos.
Signalling Processor Card (SPC/ISP)	=	4 Nos.
RAX Terminal Tester Card (RTC)	=	1 No.
Subscriber Line Card LCC/CCM/CCB	=	31 Nos.
Power Supply Card(PSU-1)	=	4 Nos.

The card distribution is as given in Fig. 3.3.

3.3.2. AN-RAX Controller Card (ARC)

The ARC card is the main controller card which performs all administrative functions of AN-RAX. Towards the line cards, it gives card select, subscriber select, clock and sync signals. It has an interface towards SPC/ISP card providing Signaling Interface to the line cards. It has an interface towards the ARI (AN-RAX Interface Card) used in slave frame for providing voice and Signaling Interface for the line cards in the slave frame.

There are two ARC cards (copy 0 & copy 1) in Master frame. ARC communicates with the duplicate ARC through HDLC link. One more HDLC link is used to communicate with the RTC cards.

There are two ACIA links. One of the link is used forms (VDU) and other link is used for Debugging terminal.

Two Digital trunks of 2.048 Mbps are provided on ARC card which are to be used in Common Channel Signalling mode (CCS). These Digital trunks are used for V5.2 interface towards the local Exchange (LE).

3.3.3. AN-RAX Interface Card (ARI)

The ARI Card acts as an extension of ARC for the cards in slave unit. The copy 0 ARI card interfaces with the copy 0 ARC card and other cards in slave frame. Similarly, copy 1 ARI card interfaces with the copy 1 ARC card and other cards in slave frame. The signals between ARI card and the corresponding ARC card are exchanged through both front end cables as well as through interframe cables on the back plane.

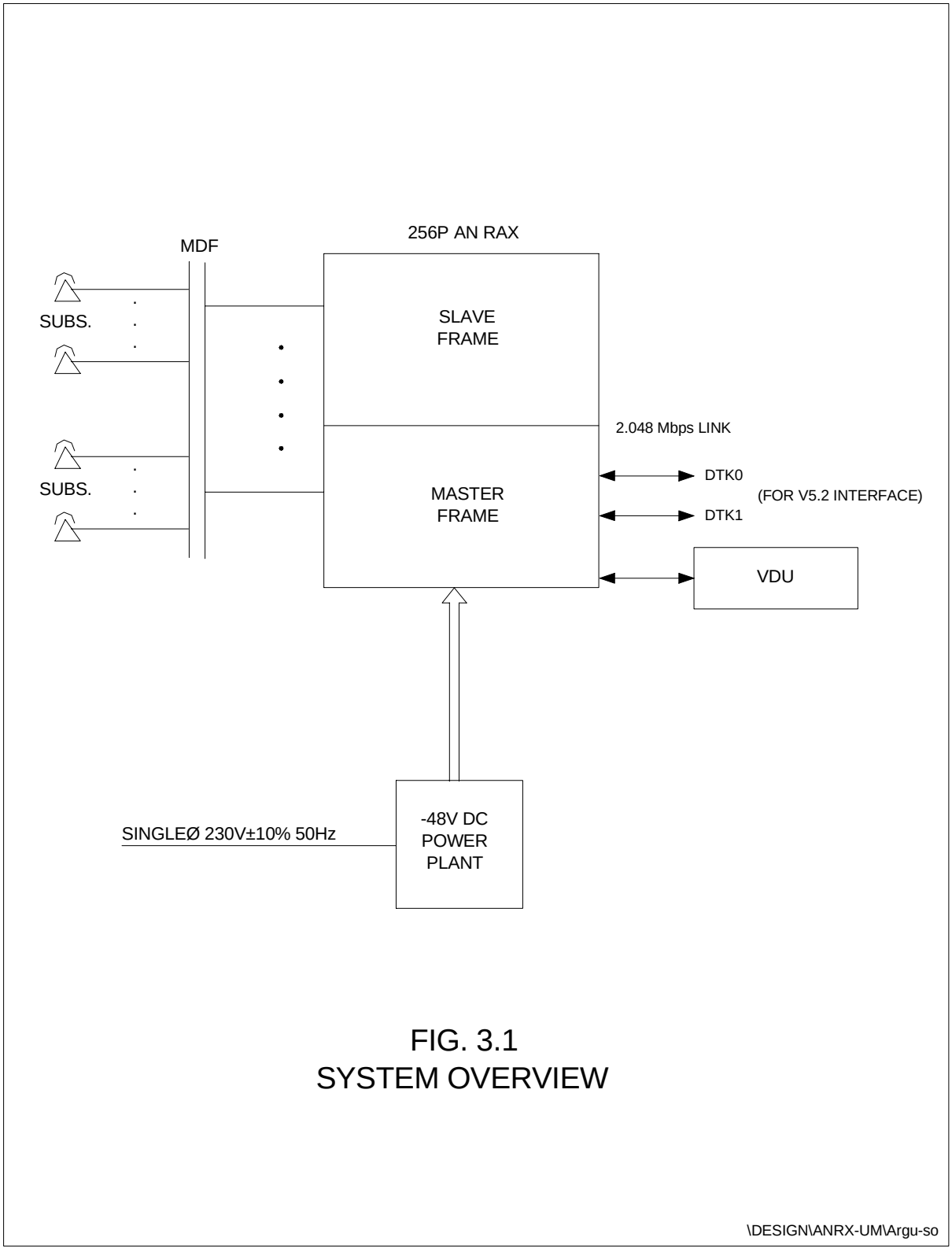

FIG. 3.1
SYSTEM OVERVIEW

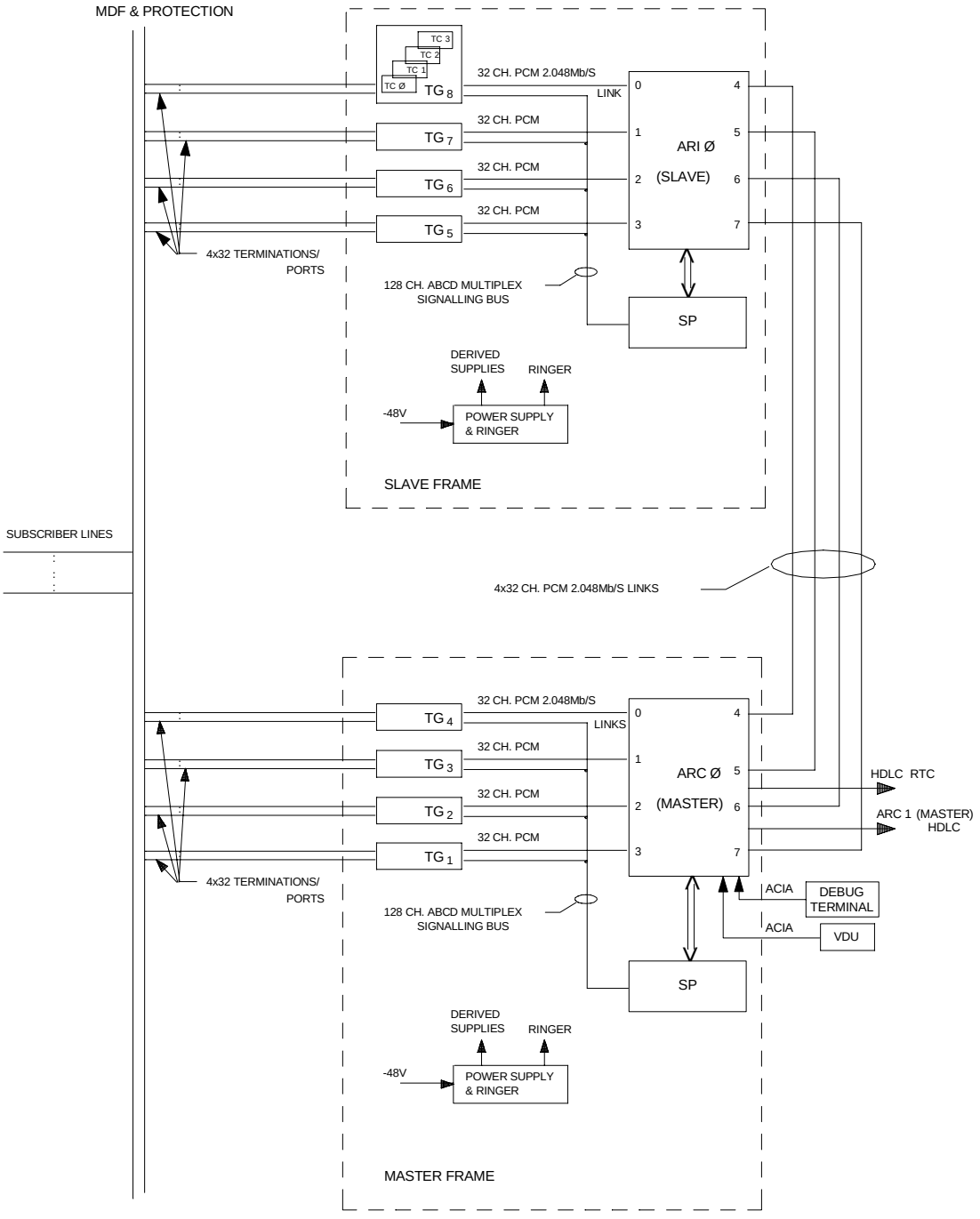

FIG. 3.2
256P AN RAX H/W ARCHITECTURE (SINGLE PLANE)

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3.3.4. Signalling Processor Card (SPC) / Integrated Signalling Processor Card (ISP)

Signalling information related to terminations such as dialled digits, ring trip etc., are separated at the Terminal Interface cards and carried to the Signalling Processor (SPC/ISP) on a time multiplexed link. The SPC/ISP passes on this information to the ARC.

3.3.5. Power and Ringing

A DC-DC converter generates the various voltages required for the system operation and also provides ringing for the subscriber loops.

Chapter 4.

Hardware Architecture

4.1. OVERVIEW

The integrated circuits used in the C-DOT 256P AN-RAX hardware have low power dissipation and high operational reliability. The components used are based on Metal-Oxide Semiconductor (MOS), Complementary MOS (CMOS), Low-Power Schottky Transistor-Transistor Logic (LSTTL), and bipolar technologies.

All the system circuitry has been packaged into seven card types. On the broad level these could be divided into following categories:

- Terminal Interfaces
  - ♦ Subscriber Line Card (LCC/CCM)
- Controller Cards
  - ♦ AN-RAX Controller Card (ARC)
  - ♦ AN-RAX Interface Card (ARI)
  - ♦ Signalling Processor Card (SPC) or Integrated Signalling Processor Card (ISP)
- Service Cards
  - ♦ RAX Terminal Tester Card (RTC)
- Power Supply Unit (PSU-I)

4.2. TERMINAL INTERFACES

C-DOT 256P AN-RAX uses Subscriber Line Card (LCC/CCM) to provide Analog Terminal Interface. Each terminal interface card caters to 8 terminations. Four cards make a Terminal Group (TG) which is associated with PCM 32 channel link towards the ARC card. Signalling information are multiplexed and placed on 4 wire ABCD signalling bus toward SPC/ISP card.

Subscriber Line Card (LCC/CCM) (Ref. Fig. 4.1)

Line Circuit Card (LCC) is used to interface ordinary subscriber lines. Fig. 4.1 gives the detailed block diagram of this card.

The Line Circuit Card performs a set of functions collectively termed as BORSCHT, signifying:

B - Battery Feed
O - Overvoltage Protection
R - Ringing
S - Supervision
C - Coding
H - Hybrid Conversion
T - Testing

- Battery Feed

  A -48V ±4V battery with current limiting facility is provided on each line for signalling purposes and for energising the microphone.

- Overvoltage Protection

  A hybrid transformer and surge arresters across Tip and Ring provide protection against over voltages.

- Ringing

  Ringing is extended to subscribers under the control of Signalling Processor (SPC/ISP card), through the contacts of an energized relay. The Ring is tripped when off-hook condition is detected.

- Supervision

  On/Off-hook detection and dialling make/break are encoded and passed on to SPC/ISP card as the scan information from the subscriber lines.

- Coding

  Coding refers to encoding of analog voice to digital form (8 bit, A-law PCM) through a coder/decoder (codec). Codec outputs of 32 codecs of each Terminal Group are time division multiplexed to form a PCM 32 channel at 2.048 Mbps.

- Hybrid Conversion

  2-wire to 4-wire conversion is done before coding for full duplex (voice) operation.

- Testing

  Metallic access is provided on subscriber lines for routine test. (Tests Access Relays)

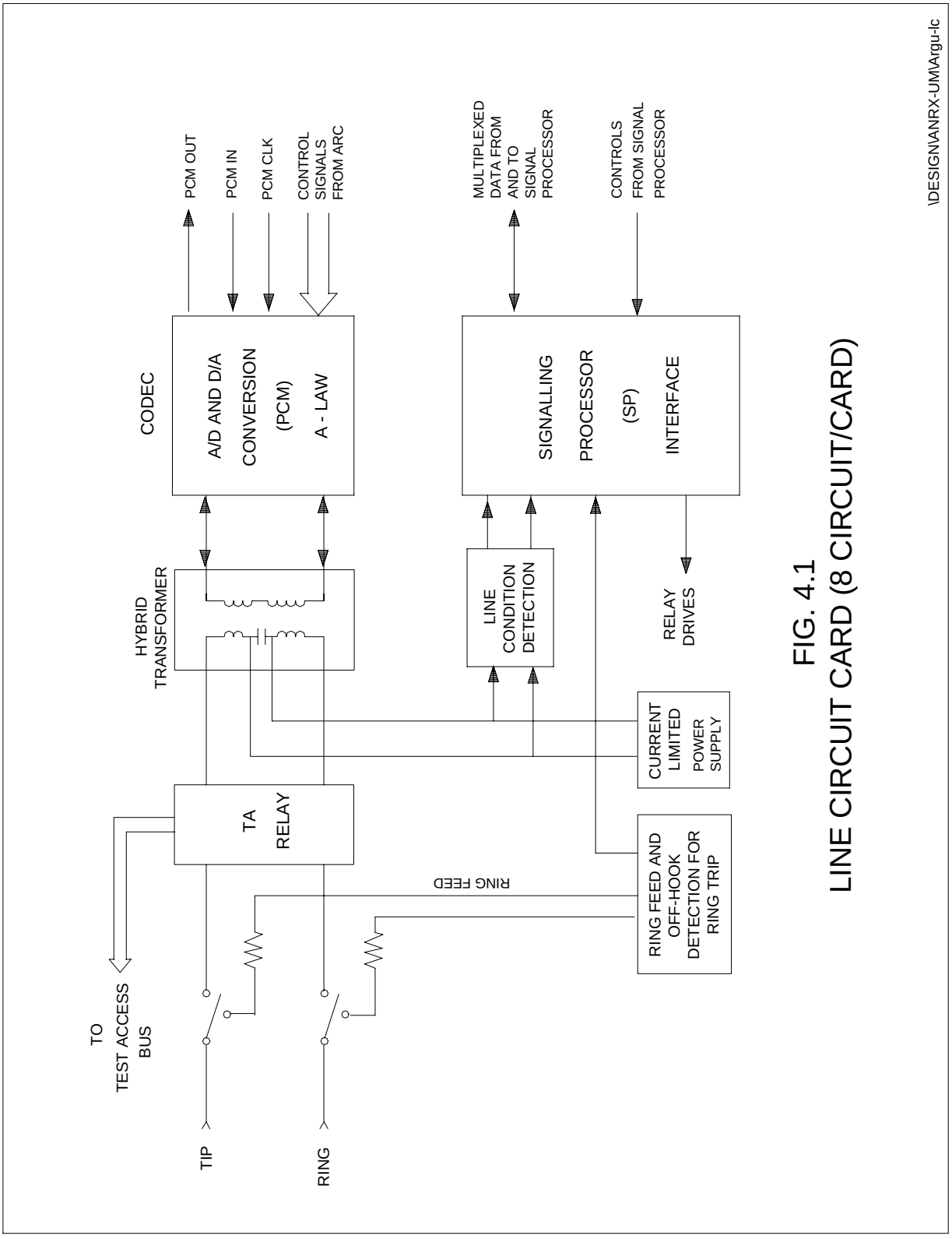

FIG. 4.1
LINE CIRCUIT CARD (8 CIRCUIT/CARD)

Coin Collection Box (CCB) interface card is an ordinary LCC card with an additional reversal relay per subscriber to extend reversal on called party answer. This card is basically used to cater to special requirements of PCOs and PABXs. However, this card can also be used as line circuit card (LCC).

Coin Collection Box with Metering (CCM) card is also same as LCC/CCB card except that it has got extra hardware to generate and feed 16 KHz pulses towards subscriber premise. This card is basically used to interface STD PCOs or special subscribers having home metering requirements. However, in CCM card out of eight ports only last two i.e., Port no. 7 and 8 are equipped with 16 KHz pulse generator. Therefore, only two subscribers per CCM card may have this provision. Rest of the ports are used for ordinary subscribers or coin collection box type. This card as a whole can be used as LCC.

4.3. CONTROLLER CARDS

The ARC card functions as the main controller of the AN-RAX. It performs time switching of voice/data slots between line cards. Towards the line cards it gives the card select, subscriber select, clock and sync signals. It has an interface towards the SPC/ISP card for providing signaling interface to the line cards. It interface towards the ARI (AN-RAX Interface) card used in slave frame to support voice and signaling interface for the line cards in the slave frame. The card exists in copy duplication and occupies slots 12 and 15 of the master frame in 256P AN-RAX. It interfaces with RTC (RAX Terminal Tester) card for supporting terminal testing in AN-RAX.

4.3.1. FUNCTIONAL DESCRIPTION

The Functional Blocks of ARC are :

Processor and memory block

Time switch and service circuits block

SPC/ISP interface block

Digital trunk interface block

DT clock extraction and generation block

ARI interface block

PSU interface block

4.3.1.1. Processor and Memory Block

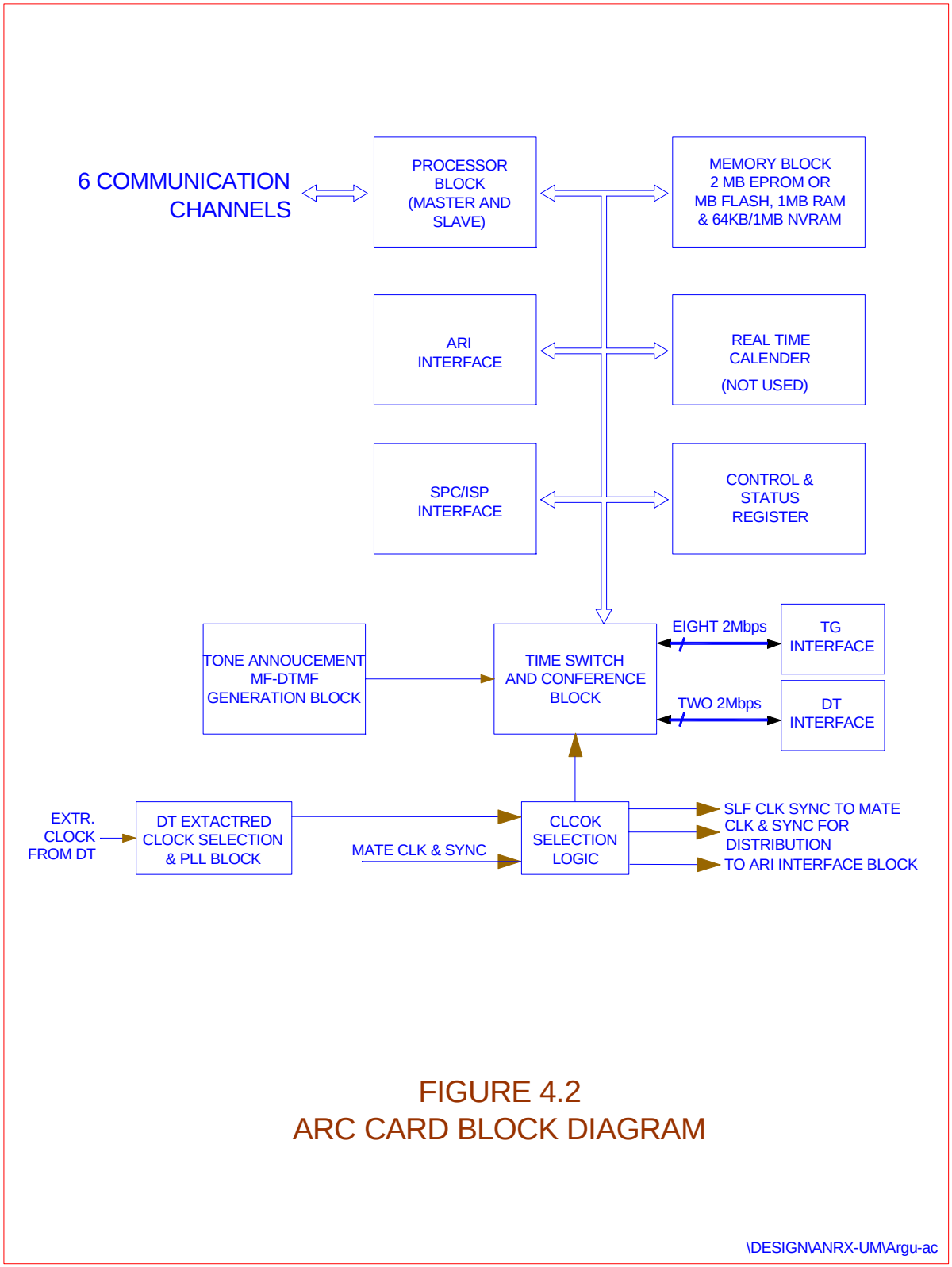
6 COMMUNICATION CHANNELS
PROCESSOR BLOCK (MASTER AND SLAVE)
MEMORY BLOCK 2 MB EPROM OR MB FLASH, 1MB RAM & 64KB/1MB NVRAM
ARI INTERFACE
REAL TIME CALENDER (NOT USED)
SPC/ISP INTERFACE
CONTROL & STATUS REGISTER
TONE ANNOUCEMENT MF-DTMF GENERATION BLOCK
TIME SWITCH AND CONFERENCE BLOCK
EIGHT 2Mbps
TG INTERFACE
TWO 2Mbps
DT INTERFACE
EXTR. CLOCK FROM DT
DT EXTACTRED CLOCK SELECTION & PLL BLOCK
MATE CLK & SYNC
CLCOK SELECTION LOGIC
SLF CLK SYNC TO MATE
CLK & SYNC FOR DISTRIBUTION
TO ARI INTERFACE BLOCK
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FIGURE 4.2
ARC CARD BLOCK DIAGRAM

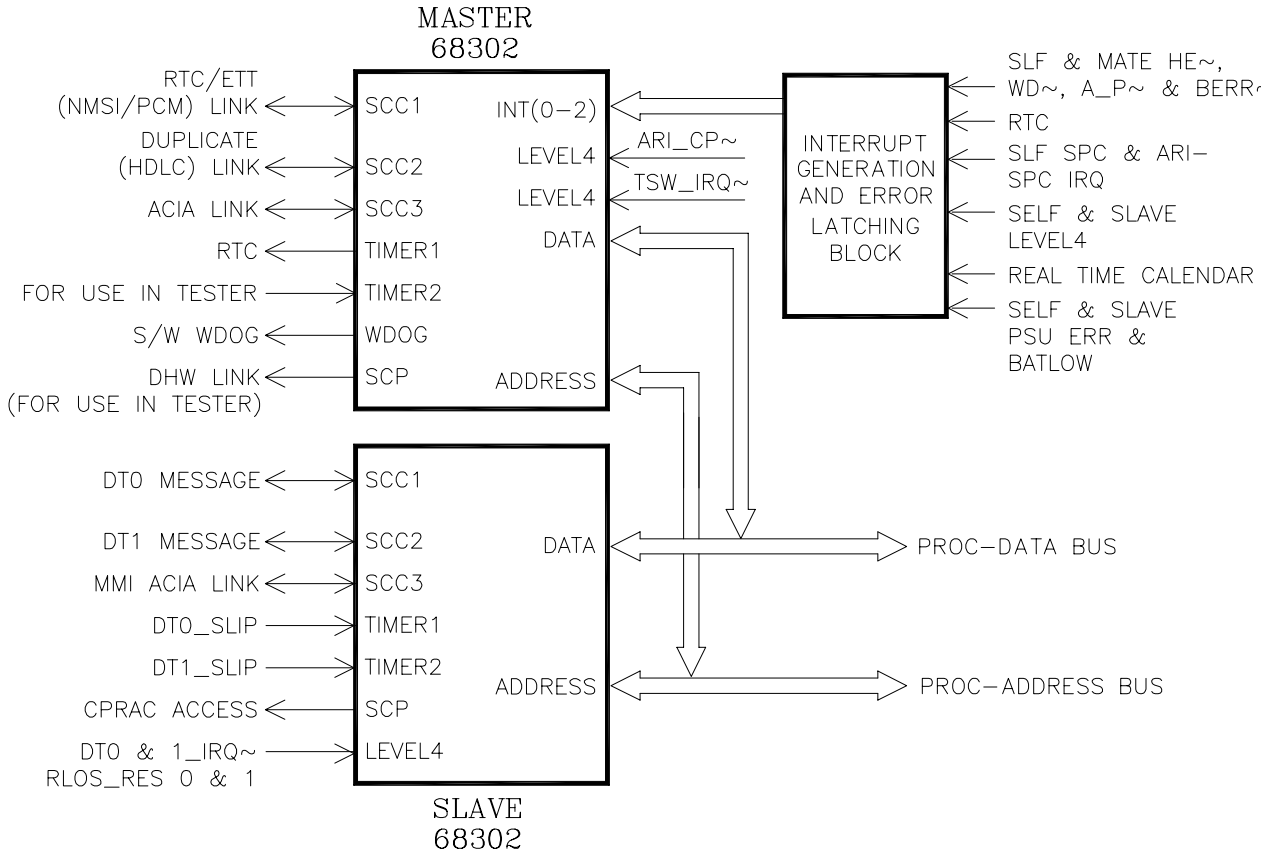


FIG. 4.3 PROCESSOR BLOCK

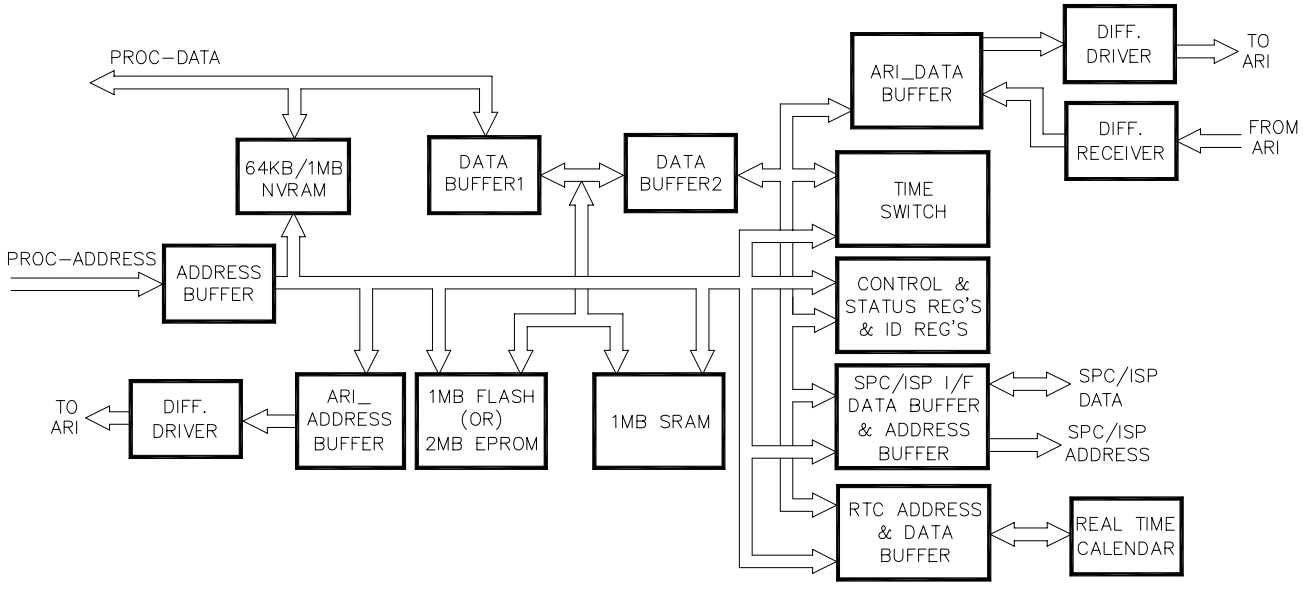


FIG. 4.4 MEMORY AND OTHER MEMORY MAPPED DEVICES

This card is designed using Morotola's 68392 processor in MASTER-SLAVE configuration as shown in the Fig. 4.3. The processor is clocked at 16.384 MHz. The processor clock is generated using a crystal oscillator. The reset circuitry uses a micro monitor chip, which asserts reset when VCC is out of range or when manual reset switch is activated or when strobe is missing. The 16.38 MHz processor input clock is divided by two and given as strobe to the micro monitor chip.

Communication Block

The master IMP's SCC1 is used as HDLC link towards RTC card or ETT card. SCC will operate in NMSI mode at 64 Kbps for RTC card and in PCM mode at 2 Mbps for ETT card.

Master IMP's SCC2 is used as HDLC link towards duplicate ARC card. Speed of this link is 64Kbps.

Master IMP's SCC3 is used as debugging ACIA link. Speed of this link is software programmable and normally is 9600 baud.

SCP of Master IMP is used to communicate with tester card in ARC card tester.

Slave IMP's SCC1 & SCC2 are used in PCM mode.

SCC1 is used to handle HDLC messages (V5.2) on DT0 link. SCC2 is used to handle HDLC messages (V5.2) on DT1 link.

Slave IMP's SCC3 is used as an ACIA link for providing MMI through a dumb terminal. Speed of this link is S/W programmable and normally is 9600 baud.

Slave IMP's SCP is used to access DT ASIC (CPRAC) registers in order to control and monitor the DT links. In this communication, processor is always the master.

Timers Block

Master IMP's Watchdog timer is used as software watchdog. The timer reference register is initialised with the time-out value. Software periodically resets the counter so that the timer count register never reaches the time-out count. If software fails to reset the timer count register within the stipulated time, timer count reaches the reference count and a level 7 interrupt is raised to IMP and also to mate ARC card.

Timer 1 of master IMP is used as RTC (Real Time Clock). This timer can be programmed to periodically interrupt the processor at regular intervals.

Timer 2 of master IMP is used as counter or timer is ARC card tester.

Timer 1 of slave IMP is used as DT0 slip detector/counter. The counter can be programmed to count the number of slip's occurring in DT link for statistical health monitoring of the DT link

Timer 2 of slave IMP is used as DT1 slip detector/counter.

Real Time Calendar

The ARC card has been provided with one Real Time Clanedar chip, which can count the time, date, day of the week & Year. At present, this is not used.

Control and Status Registers Block

The Port A and Port B registers of master and slave processors are used as control and status registers. Some of the control and status registers are implemented externally using programmable devices. They are used to latch the status of all interrupts and to clear the latched status, program loop back bits and to latch ID bits from the back plane.

Interrupt Logic Block

This block receives all error interrupts and peripheral interrupts, prioritizes them and inputs to master IMP. Some interrupts are given directly to the Port B interrupt pins of master and slave at level 4. All the events are latched and the status is provided to the processor through status registers. The processor can clear the latched events by appropriately setting the corresponding bits in the control registers. Interrupt from SPC/ISP card master frame and slave frame are combined and presented at level 5. Error signals from Master and slave PSU cards are combined to generate a level 1 interrupt to the processor.

Memory Block

This card supports onboard memory of 1MB FLASH or 2MB EPROM, 1MB RAM and 64 KB/1MB NVRAM. Chip selects are generated using master and slave IMP's chip select registers and glue logic. One jumper is provided to select either FLASH or EPROM and one more jumper is provided to select NVRAM capacity.

4.3.1.2. Time Switch and Service Circuits Block

This card has a 2K by time switch, implemented in FPGA. The time switch is operated at 8NHz speed and is used in 16 bit processor mode. One input link is programmed as conference link. Speed of the conference link is 8Mbps and it supports 32 Four party conferencing. 12 out of 16 possible I/O links are used as shown below.

The input links of the time switch are :

1. One conference link (8Mbps) for 32 four party conferencing

2. One 8Mbps link from Tone, Announcement, MF and DTMF generation circuit.
3. Eight 2Mbps links (TG (0)_IN to TG (7)_IN) from TGs.
4. One 2Mbps link for DT and ETT messages
5. Two 2Mbps links from DTs

The output links of the time switch are :

1. One link for conferencing (8Mbps)
2. Eight 2 Mbps links (TG (0)_OUT to TG (7)_OUT) towards TGs.
3. One 2 Mbps link for DT and ETT messages
4. Two 2 Mbps links towards DTs.

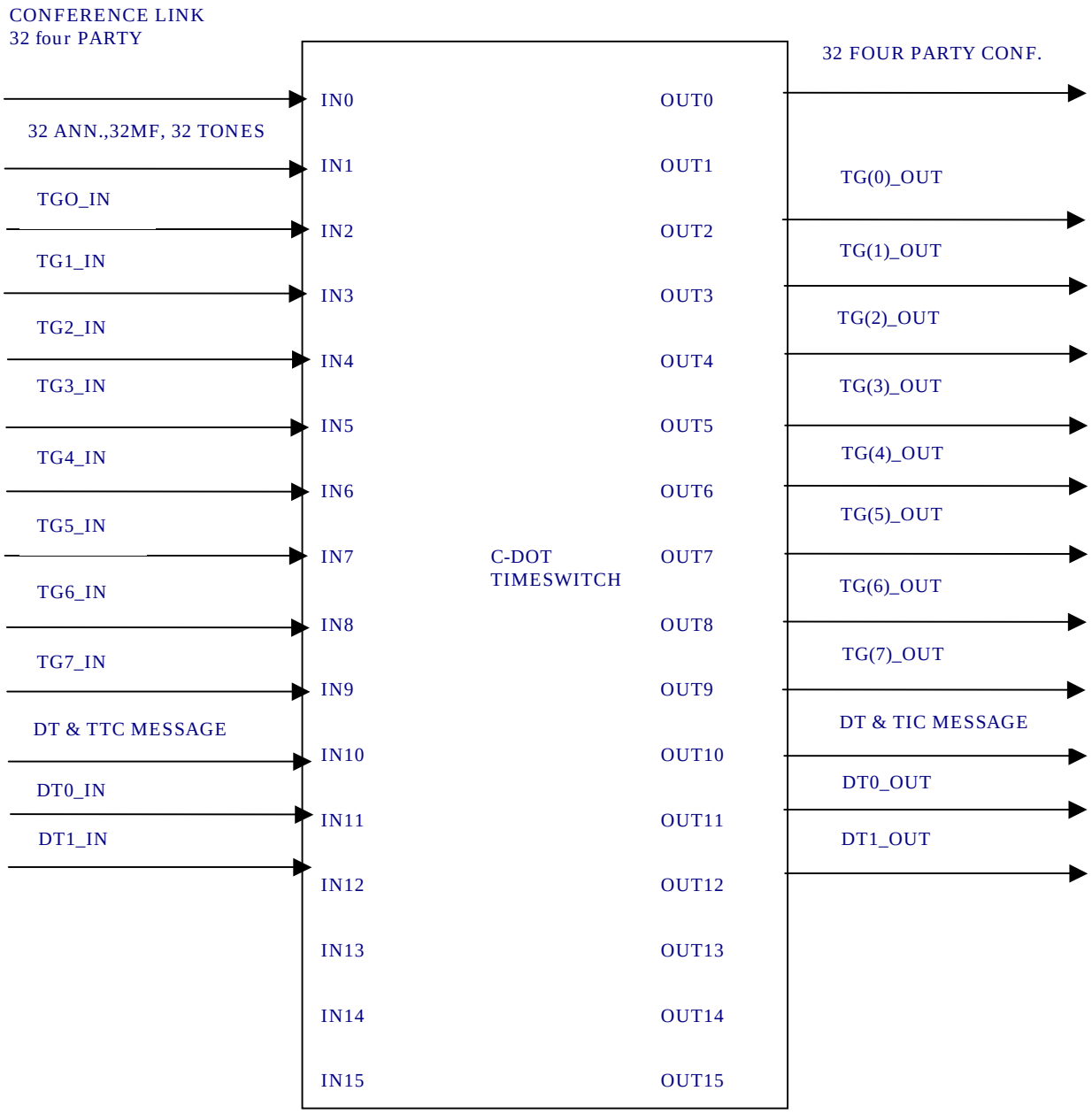


FIG. 4.5 TIME SWITCH INPUT OUTPUT LINKS USAGE

Tone, Announcement, MF-DTMF Generation

The MF, DTMF, tone and announcement samples are stored in EPROMs. The EPROMs are addressed by free running counter chains, which are implemented in FPGAs. Bank control EPROMs are used to address different pages of the stored data. Parallel output of EPROMs are converted to serial link at 8 Mbps and connected to time switch as shown in Fig. 4.6.

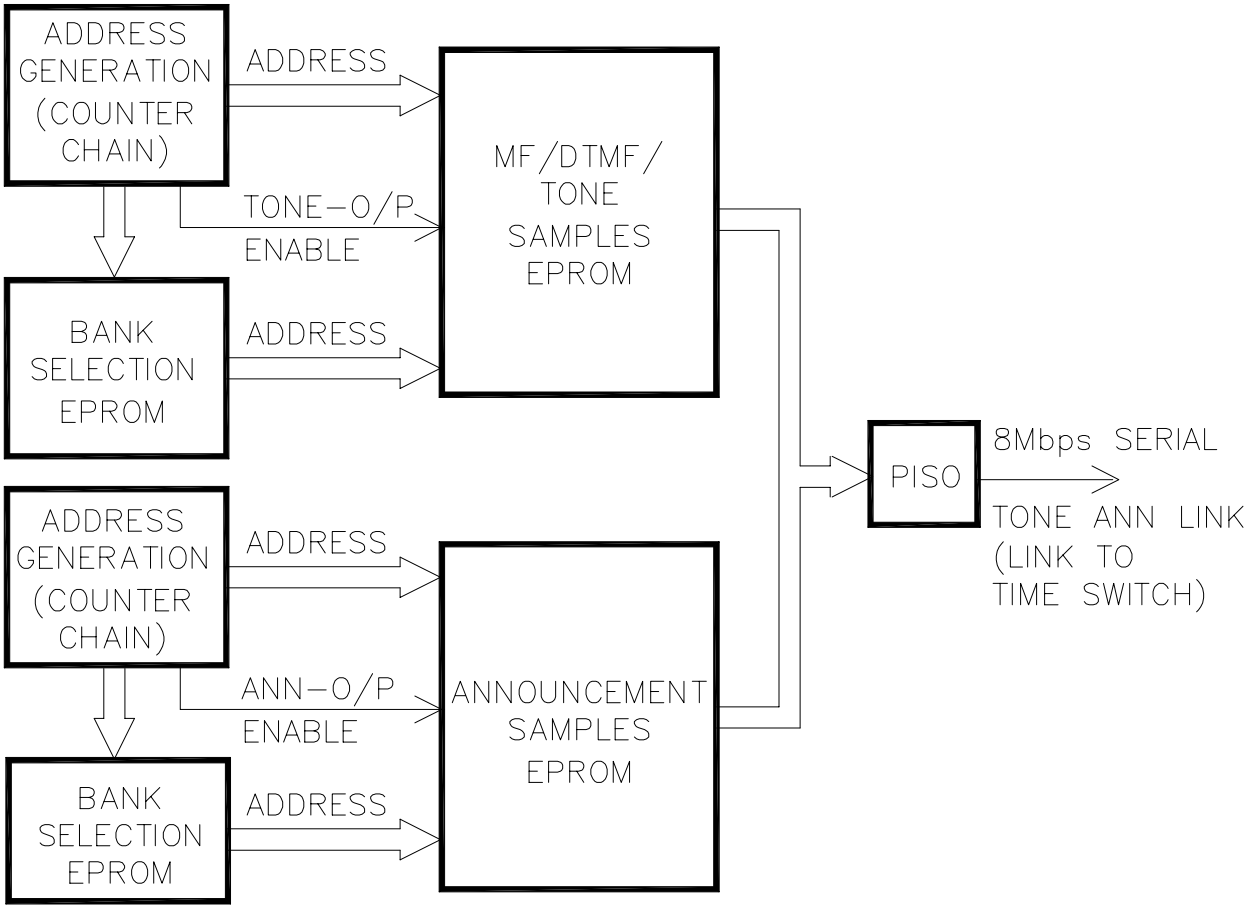


FIG. 4.6 ANN/TONE/ME/DTMF GENERATION BLOCK

4.3.1.3. SPC/ISP Interface Block

This card interfaces with SPC/ISP card in the master frame to provide signalling interface for the 128 ports. Chip select for the SPC/ISP card is given by the external logic implemented. 3 address bits, 8 data bits and one read write bit are provided for configuring the SPC/ISP registers. IM Clock signal is provided for SPC/ISP operations and processor synchronized clock signal is provided for memory operations.

This card also has an interface towards the SPC/ISP card in the slave frame. This interface is through the ARI (AN-RAX Interface) card present in the slave frame.

4.3.1.4. Digital Trunk Interface Block

The card supports two E1 link in CCS mode. One CPRAC (C-DOT Primary Rate Access Controller) is used. The E1 links conform to G.703, G.704, F.706 and G.732 and are supported on 120Ohm symmetric twisted pair interface.

CPRAC has two sets of 16 registers to individually configure the two digital trunks. These registers are used to control and monitor the links.

The clock extracted from digital trunk is multiplied (using PLL) to generate the 8MHz clock refer Fig. 4.8. The error status signals like receiver loss of sync (RLOS), receive remote alarm (RRA) are reported through interrupts. Loop back provision is given for both the DTs through relays, which can be used for diagnostics pupose by setting the loop back bits in the control and status registers. The relays are also used to ensure that only the active ARC card will dirve the physical E1 links.

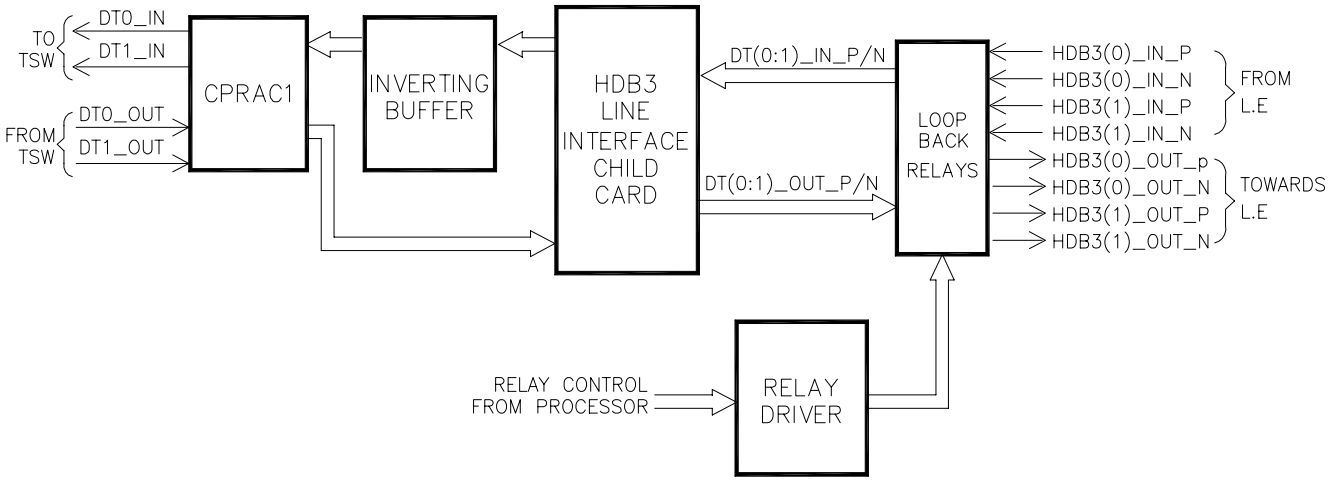


FIG. 4.7 DT INTERFACE BLOCK

4.3.1.5. DT Clock Extraction and Generation Block

The CPRAC gives out extracted clock from both the digital trunks. One of this is selected and input to the PLL. Thus the on board VCXO clock is made to lock to the extracted clock. Refer Fig. 4.8.

Clock Selection Block

The following clock and sync selections are possible :

a) Network synchronized clock and sync from duplicate ARC card

b) Network synchronized clock and sync from duplicate ARC card

c) No clock

The processor will select one out of these clocks depending on the mode of operation. Hardware error generation logic is implemented to generate the error for the absence of the clock or improper clock. Selecting the option `c' can test this logic.

Refer PCM clock generation, selection, Detection & Distribution Block below:

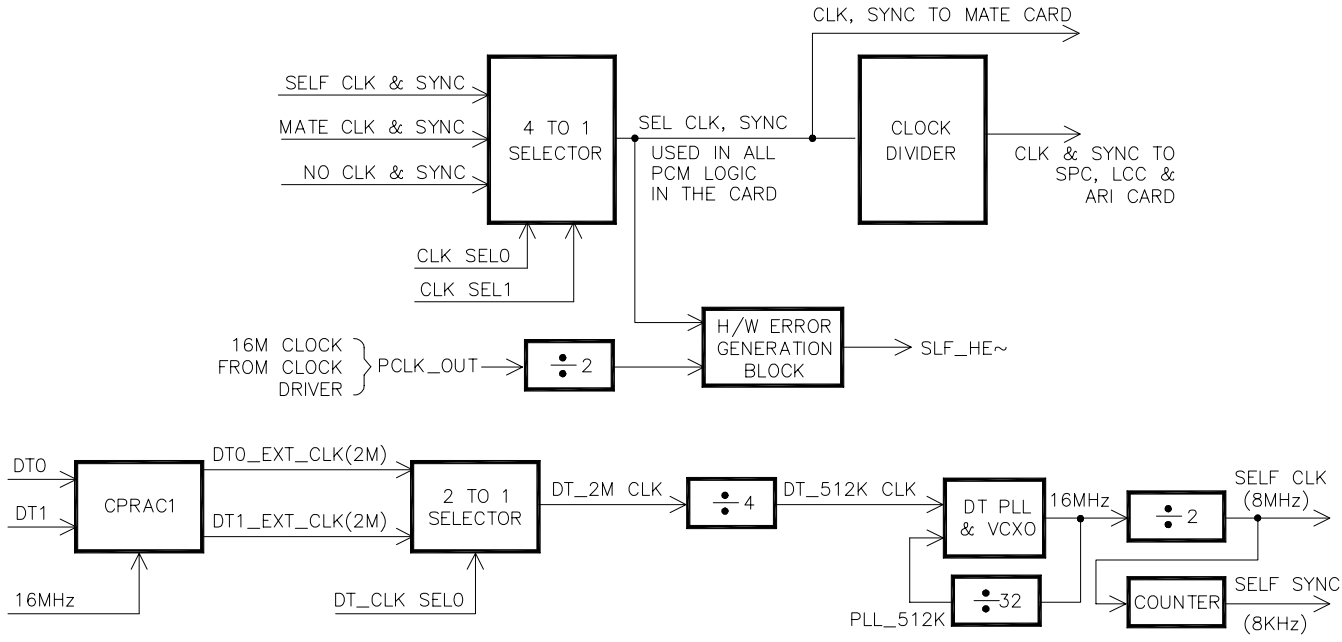


FIG. 4.8 CLOCK GENERATION, DETECTION & DISTRIBUTION BLOCK

4.3.1.6. ARI Interface Block

The voice and signalling interface for the line cards in the slave frame is achieved through this interface. The processor bus and the necessary control signals required for the SPC/ISP card in the slave frame are exchanged in the differential form to support the 128 ports in slave frame. The status of the PSU cards in slave frame is made available at ARC card through this interface. The signals between ARC and the corresponding copy of ARI are

exchanged through both back plane interface cable and fron-end 60 pin FRC cable.

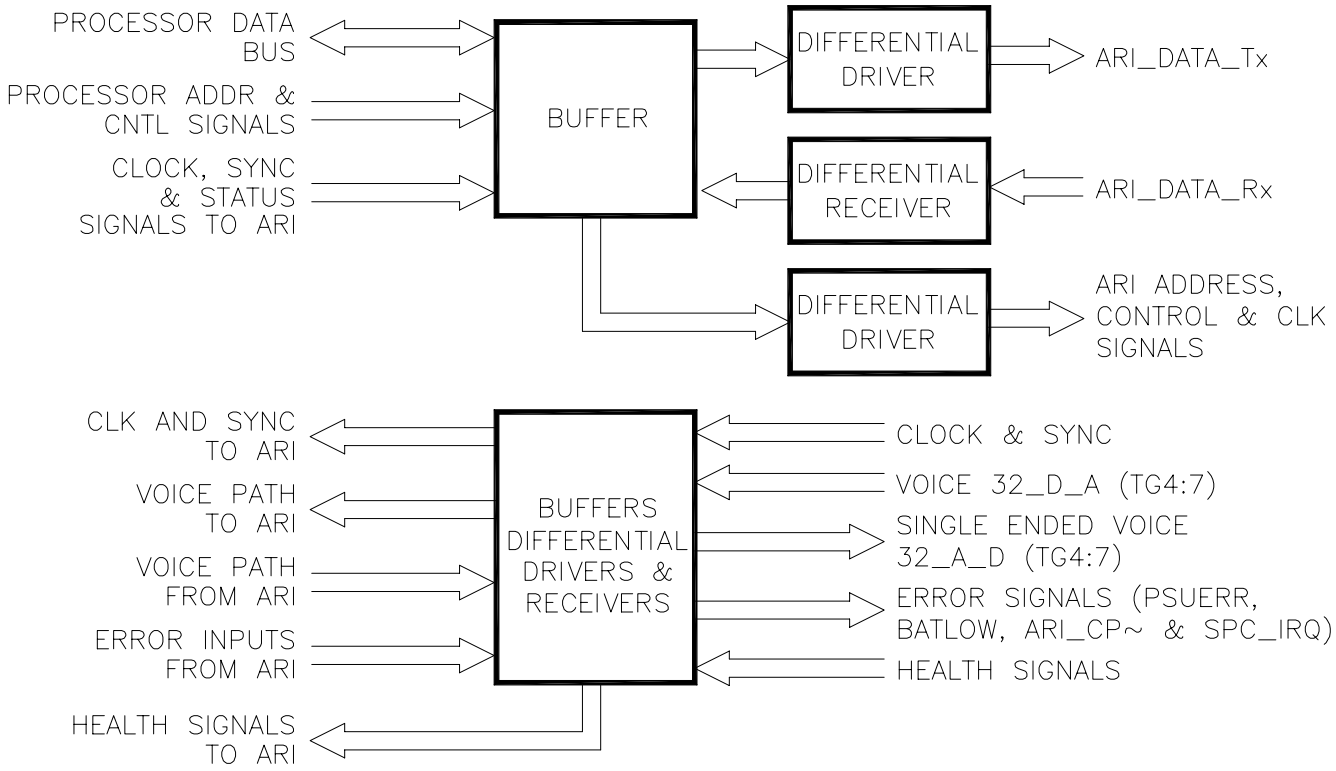


FIG. 4.9 ARI INTERFACE BLOCK

4.3.1.7. PSU Interface Block

The card draws power from the back plane 5V supplied by the PSU cards. The PSUERR and BATTERY LOW signal from the copy 0 and copy 1 PSU cards interrupts the processor whenever PSU output voltage or battery goes out of range.

4.3.1.8. Testability and Faulty Coverage

All part of the processor logic can be tested by checking the access to the devices. Loop back feature is provided for all the PCM links. MF, DTMF generation logic can be tested by switching the tones to PCM link.

DT logic can also be tested by pattern insertion/extraction from time switch and by enabling DT relay loop back. DT events such as RLOS and SLIP are given as interrupt to the processor so that health status of the DTs can always be monitored.

The critical signals in the ARC card are given the fault coverage. The software sanity is monitored with the help of watchdog timer. The presence and the tolerance of the 8 MHz clock is always monitored and indicated to the processor as the hardware Error. Bus error signal is generated when there is access to non-existent memory location, write access to PROM and all the IMP access in which DTACK is not asserted by IMP with in a programmed number of wait states from address strobe active.

All the PSU errors are given as interrupt to the processor so that alarms can be raised to indicate the PSU failure. The card presence of the ARI is also given as level 4 interrupt.

The Watchdog, Hardware error signal, Active to Passive transition and manual reset of the self copy are given as interrupt to mate card so that copy switchover can be achieved when one copy fails.

Using potential signals are brought out of the card for use in Go-No Go tester.

4.3.2. AN-RAX Interface Card

ARI organisation can be split into following blocks

- LCC interface block
- SPC (Slave) - interface block
- PSU - interface block
- ARC interface block

4.3.2.1. LCC Interface Block

This block provides interface to the voice signals (PCM links), 2M PCM clock, terminal card select signals, terminals address signals, status signal ($\overline{HE}$, $\overline{A/P}$, $\overline{WDOG}$), from ARC to ARI & vice versa. It receives signal from ARC in differential form and converts them into single ended signals. Similarly signals received from LCC cards in slave frame are converted into differential form and then sent to ARC in same plane of master frame.

4.3.2.2. SPC (Slave) - Interface Block

This block receives the differential bi-directional data bus from ARC and converts them into single ended form and vice versa. Similarly differential address and control signals received from ARC are converted into single ended form. These signals are buffered and sent towards SPC in the same plane of slave frame.

The interrupt from SPC is buffered converted to differential signal, buffered and sent towards ARC in same plane of master frame.

4.3.2.3. PSU-Interface Block

This block receives the power supply error signals from both PSU's in slave frame. These signals are buffered and sent to ARC in the same plane of master frame.

4.3.2.4. ARC Interface Block

The differential 16.384 MHz PCLK, differential chip select signal from ARC are converted into single ended form and given to EPLD. The differential spare inputs from ARC are converted to single ended form and given to EPLD.

The spare outputs from EPLD are converted to differential form and given to ARC in same plane of master frame.

Chapter 5.

Software Architecture

The Software architecture is completely modular. It comprises of entities which operate in a layered environment, with physical, data link and network layers, to support the communication between AN-RAX and LE. Most of the entities use an FSM based approach. The coding is done in C language. The entire software runs on the ARC card. The other processor based card in the system is the RTC card. The software for this card is reused from the RAX product.

5.1. SOFTWARE ENTITIES

Maintaining modularity, the architecture has been conceived as comprising of two major modules: the V5 Module and the AN Module.

5.2. V5 MODULE

This comprises of entities/processes which handle the V5 protocol towards the Local Exchange(LE).

i) Core Protocols

It consists of the processes for PSTN protocol (PSTNT), CONTROL protocol (CPT), Bearer Channel Connection (BCC), LINK CONTROL protocol (LCP), and PROTECTION protocol (PPT).

ii) System Management /Access Initialisation Task (AIT)

It consists of the system level general management and the layer 3 management for the V5 protocols.

5.3. AN MODULE

This comprises of entities/processes which handle the product related features.

i) Maintenance Software / Fail Safe Task (FST)

It implements strategies for providing fail safe services to the ANRAX subscribers.

ii) Man Machine Interface / Operation Administration Task (OAT)

The user interface is provided through an RS232 interface. The MMI provides interface for the user to configure the V5 interface and perform the maintenance functions on subscriber ports and V5 links.

iii) Port tester Task (PTT)

This process handles the RTC (tester card) communication protocols and the port testing.

iv) SPC Interface Task (SPT)

This process handles the interrupts and subscriber events reported by SPC/ISP card from the line side. Also handles the ring cadence and metering pulse feeding.

v) Layer 2 management/Data Link Protocol Task (DLPT)

Manages the data link entity. It also acts as a message parser and distributor for ANRAX system for message received on V5 links and IPCP links. The functionality regarding the management of V5 links is shared with protection protocol entity.

vi) Data Link Entity/Data Link Control Task (DLCT)

It implements the data link layer functionality for both : V5 protocol and Inter processor communication within ANRAX. It handles the error correction and ensures reliable communication over physical channels.

vii) Driver/Serial Communication Control Task (SCCT)

It is the interface between Data Link Entity and Communication channel.

viii) Real time Operating System (XRTS)

The operating System is real time, based upon Xinu Operating System (Xinu Real Time OS).

ix) Database Task (DBT)

This process takes care of maintaining and updating the V5, system and port related data in both active and standby ARCs. Any status change in active card is immediately updated to standby.

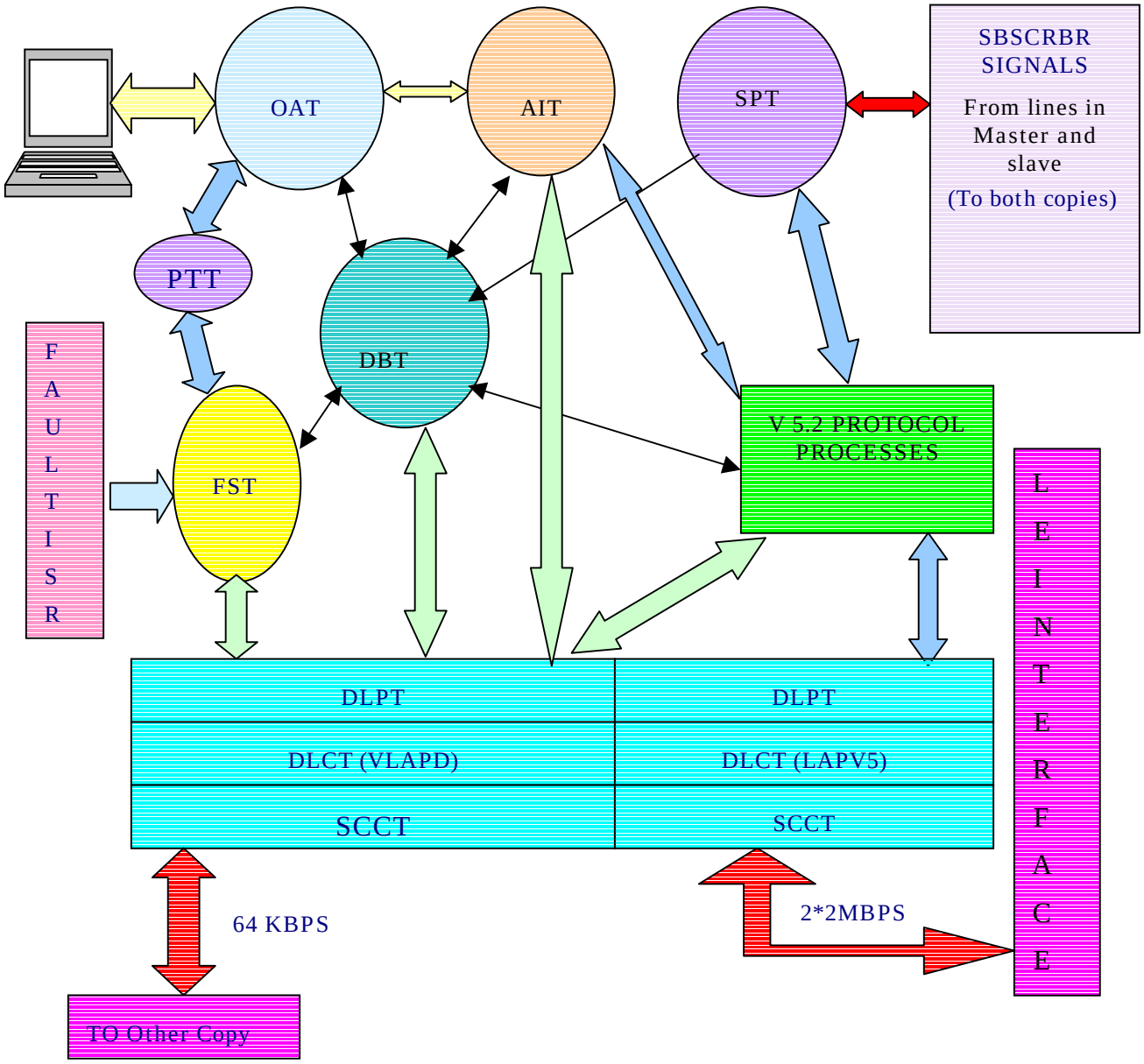


Figure 5.1 : Process Interaction Diagram

5.4. MESSAGES AND THEIR FLOW IN V5 PROTOCOL

5.4.1. V5 Messages

As we know, V5 protocol is `message based', i.e., any information between LE and AN is exchanged through messages available in different protocols. The list of messages available in different protocols is given below.

5.4.2. PSTN Protocol

i) Establish

ii) Establish Ack

iii) Signal

iv) Signal Ack

v) Status

vi) Status Enquiry

vii) Disconnect

viii) Disconnect Complete

5.4.3. Control Protocol

i) Port Control

ii) Port Control Ack

iii) Common Control

iv) Common Control Ack

5.4.4. BCC Protocol

i) Allocation

ii) Allocation Complete

iii) Allocation Reject

iv) De-allocation

v) De-allocation Comp

vi) De-allocation Reject

vii) Audit

viii) Audit Complete

ix) Protocol Error

5.4.5. Link Control Protocol

i) Link Control

ii) Link Control Ack

5.4.6. Protection Protocol

i) Switch Over Request

ii) Switch Over Ack

iii) Switch Over Com

iv) Switch Over Reject

v) Protocol Error

vi) Reset SN Com

vii) Reset SN Ack

5.4.7. Message Flow

Message flow between AN and LE is explained in sec. 5.4.7.1 & 5.4.7.2 with the help of examples. Further, message flows in different call scenario is given at the end of this chapter.

5.4.7.1. Call Initiated From LE

On receiving a call request from the network for a particular AN port, LE feeds call routing tone to calling subscriber and proceed to get a bearer channel for this call by sending an ALLOCATION message to AN and starts a timer. After getting on ALLOCATION COMPLETE message from AN, LE sends on ESTABLISH message to AN with cadenced ringing parameter to connect the ring to user port and starts a timer. AN sends ESTABLISH ACK message and call enter into ringing phase.

In case AN subscriber has caller-id feature in which directory number of calling subscriber is to be sent to user's equipment. LE shall send ESTABLISH message to AN without cadenced ringing parameter. LE shall send the digits in-band and thereafter send a SIGNAL message with Cadenced Ringing to AN to connect ring to user port.

Call enters into conversation phase when answer is received from the AN subscriber, answer should be communicated across V5 interface by sending SIGNAL (Off Hook) message to the other end.

Various subscriber features can be initiated by the subscriber by doing Hook Switch Flash when the call is in the conversation phase.

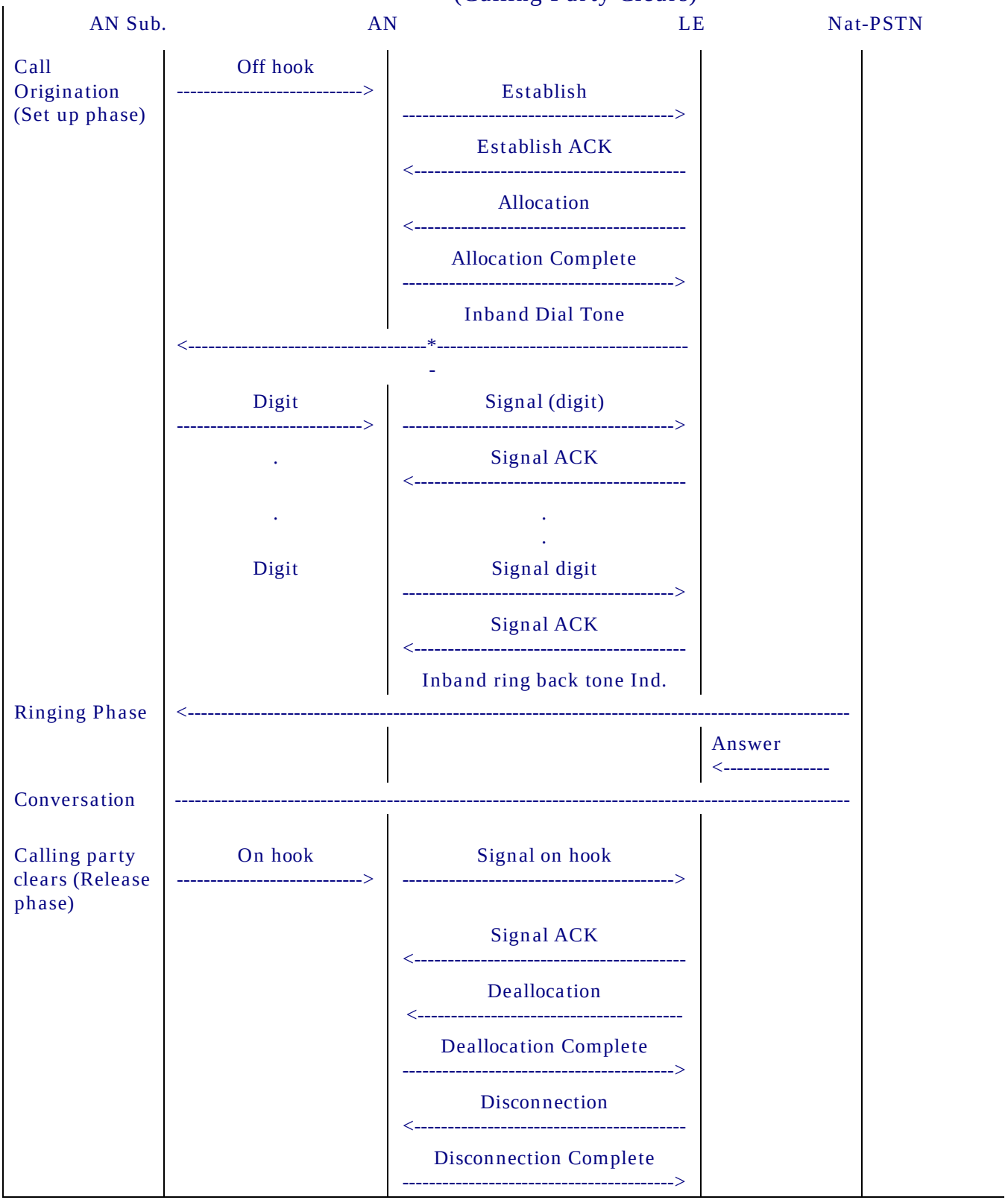
If the release of the call is initiated from LE, parking tone should be fed to AN subscriber, parking tone timer shall be run at LE and disconnection from AN subscriber be awaited. AN subscriber disconnects before the expiry of parking tone timer, this indication comes in the form of SIGNAL (On Hook) message across V5 interface. Call clearing is started by sending DEALLOCATION message and on getting DEALLOCATION COMPLETE, PSTN protocol is cleared by DISCONNECTION/DISCONNECTION COMPLETE message.

5.4.7.2. Call Initiated From AN

AN on detecting an origination from user port should send ESTABLISH message to LE. LE shall send ESTABLISH ACK message in response, gets a bearer channel by ALLOCATION/ALLOCATION COMPLETE and connect dial tone to the channel.

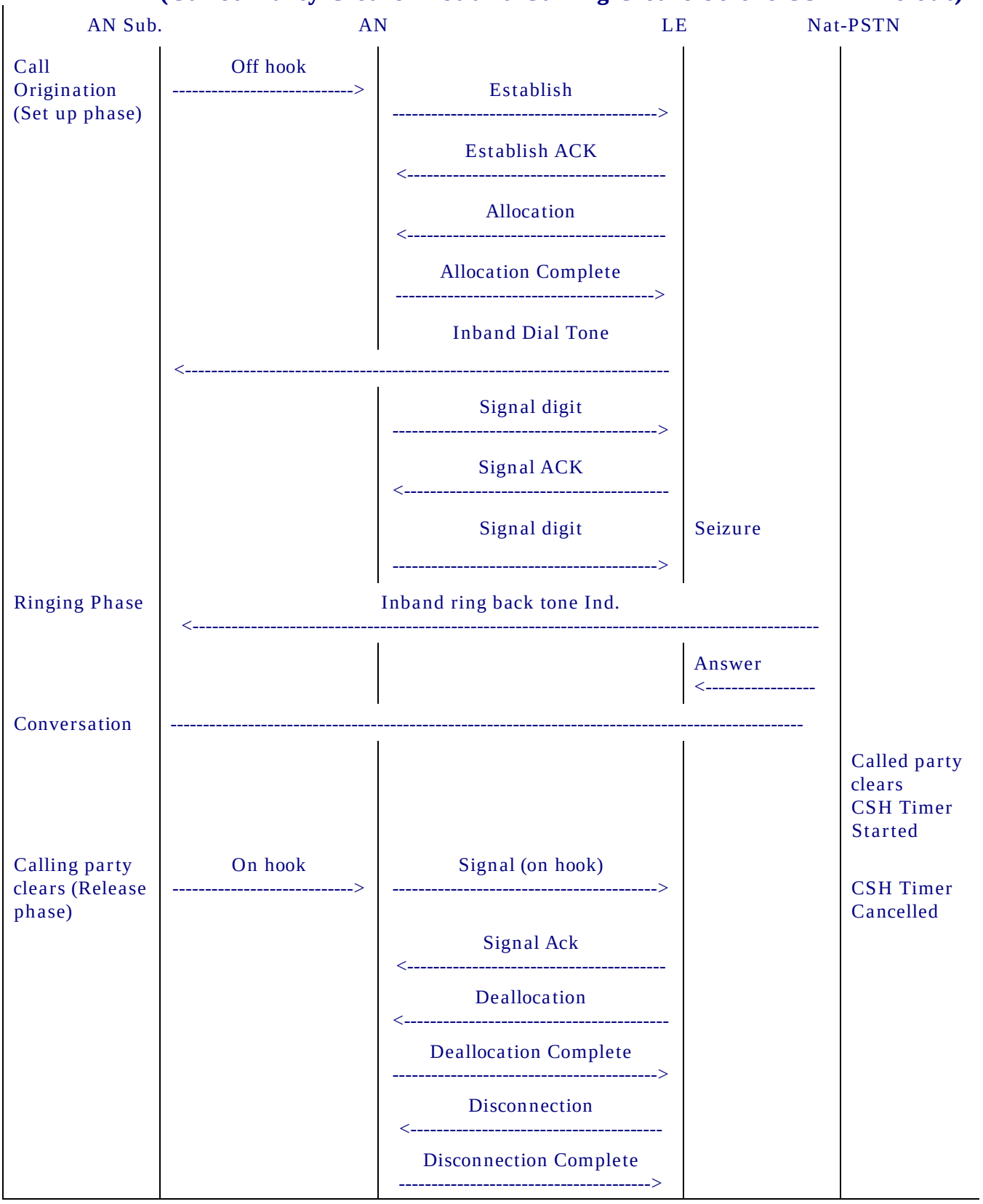
When answer is received from PSTN subscriber, call will enter into conversation phase. For AN originated calls from subscribers with home metering facility, metering pulses shall be reported to AN in the form of SIGNAL (Meter Pulse) message over the V5 interface.

DIFFERENT CALL SCENARIOS
AN ORIGINATED CALL
(Calling Party Clears)

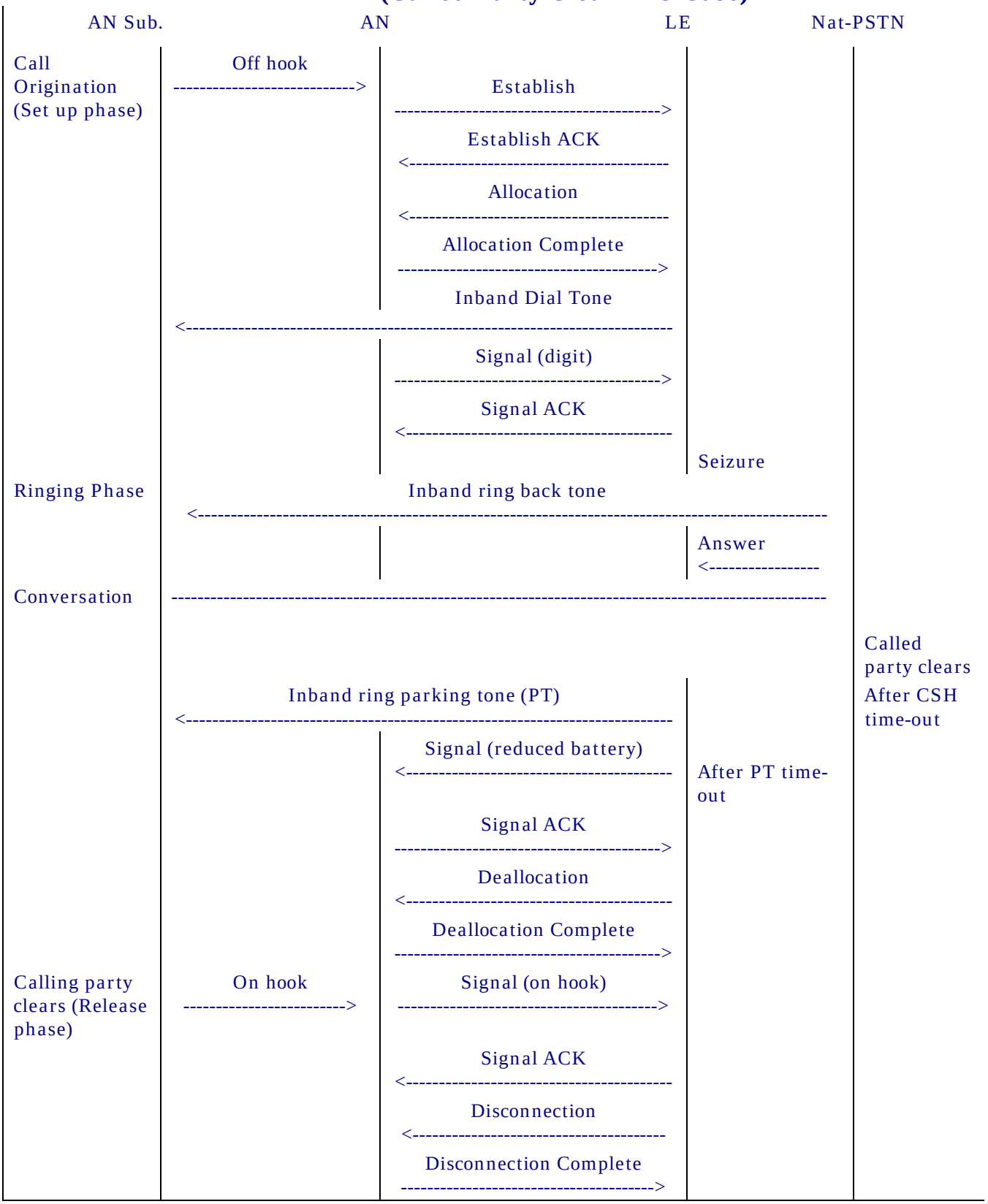


AN ORIGINATED CALL

(Called Party Clears first and Calling Clears before CSH Time-out)

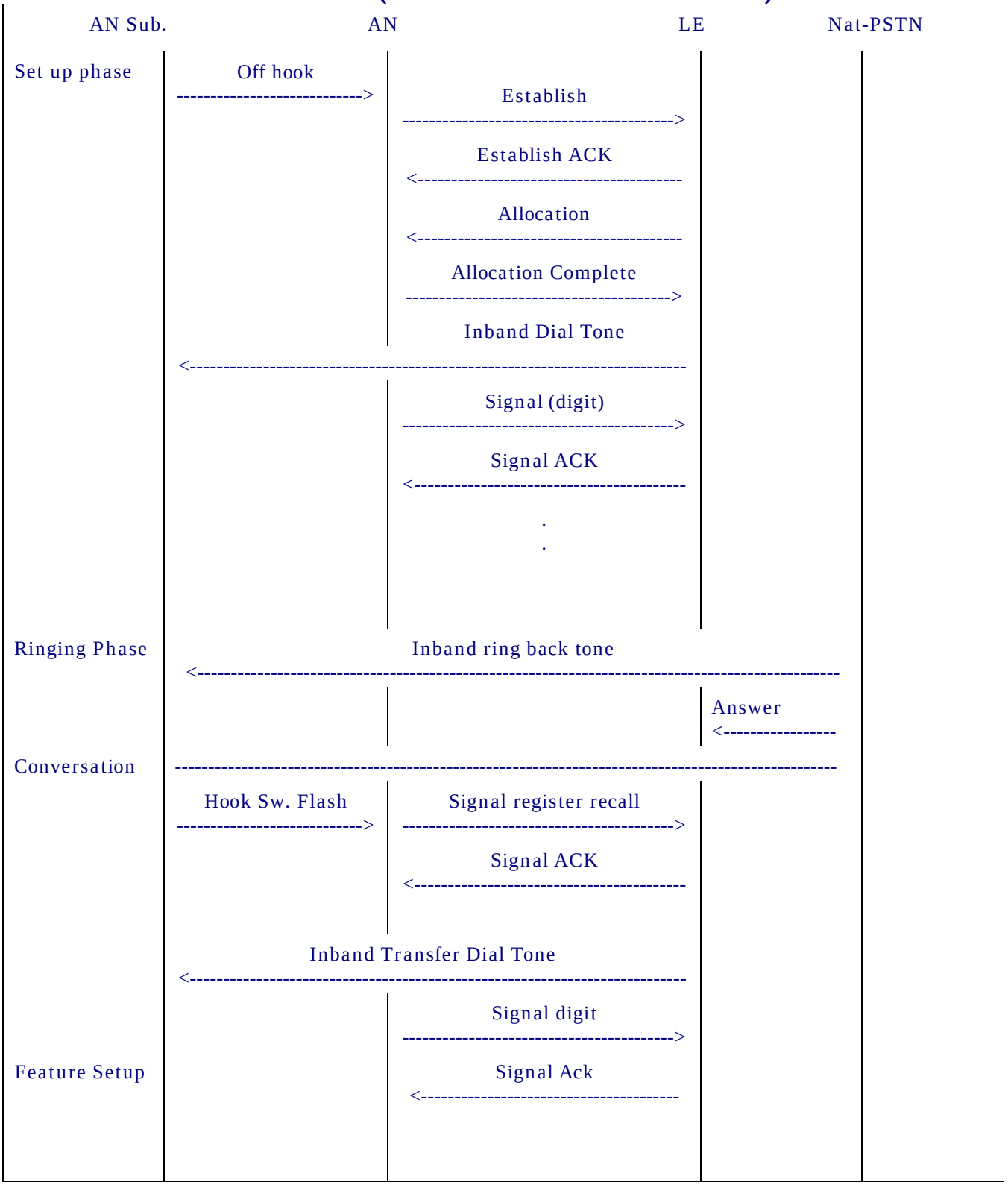


AN ORIGINATED CALL
(Called Party Clear LLO Case)



AN ORIGINATED CALL

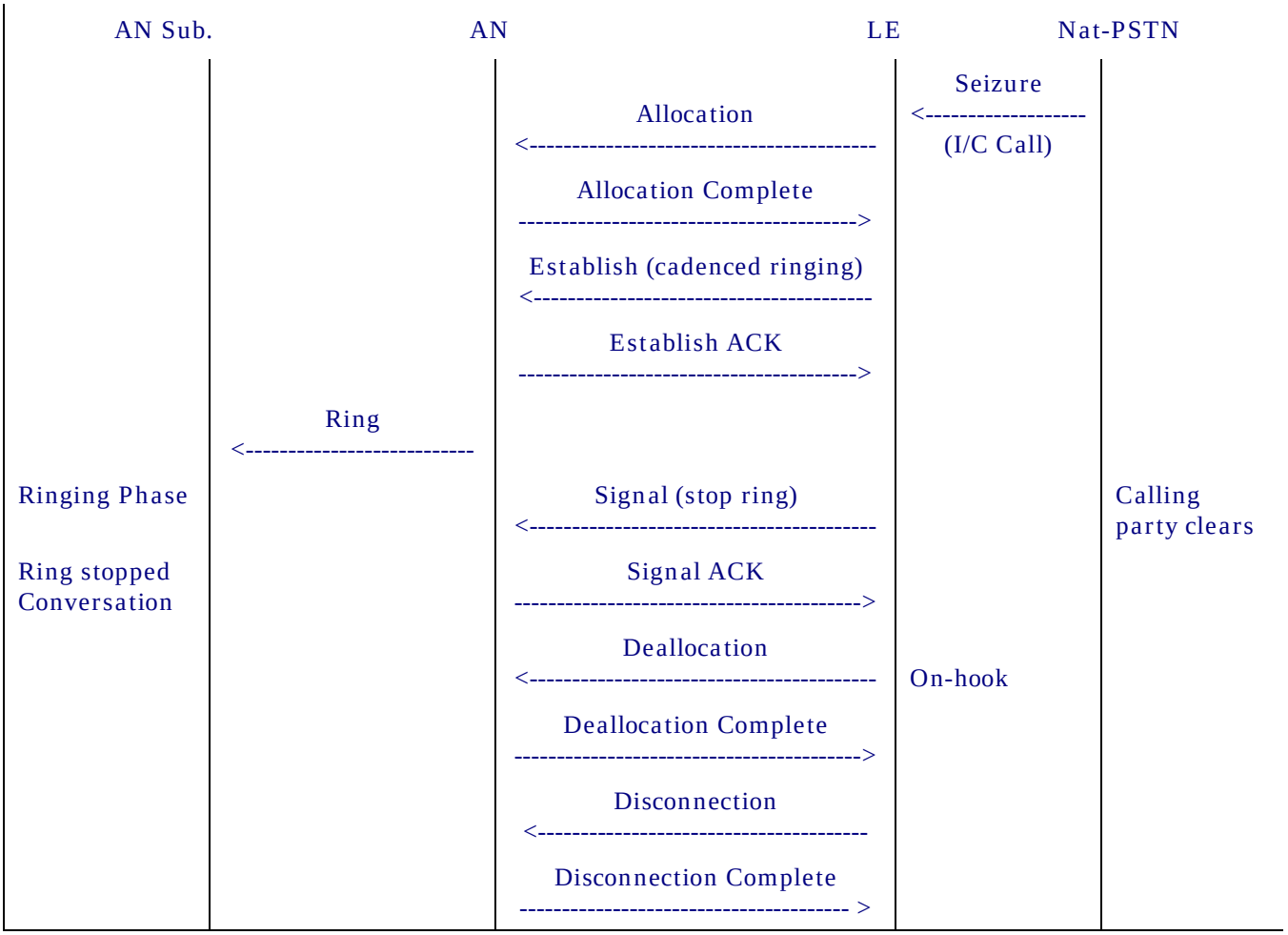
(Subscriber Hook Switch Flash)



Rest steps are same as ~ AN originated call (calling party clears)

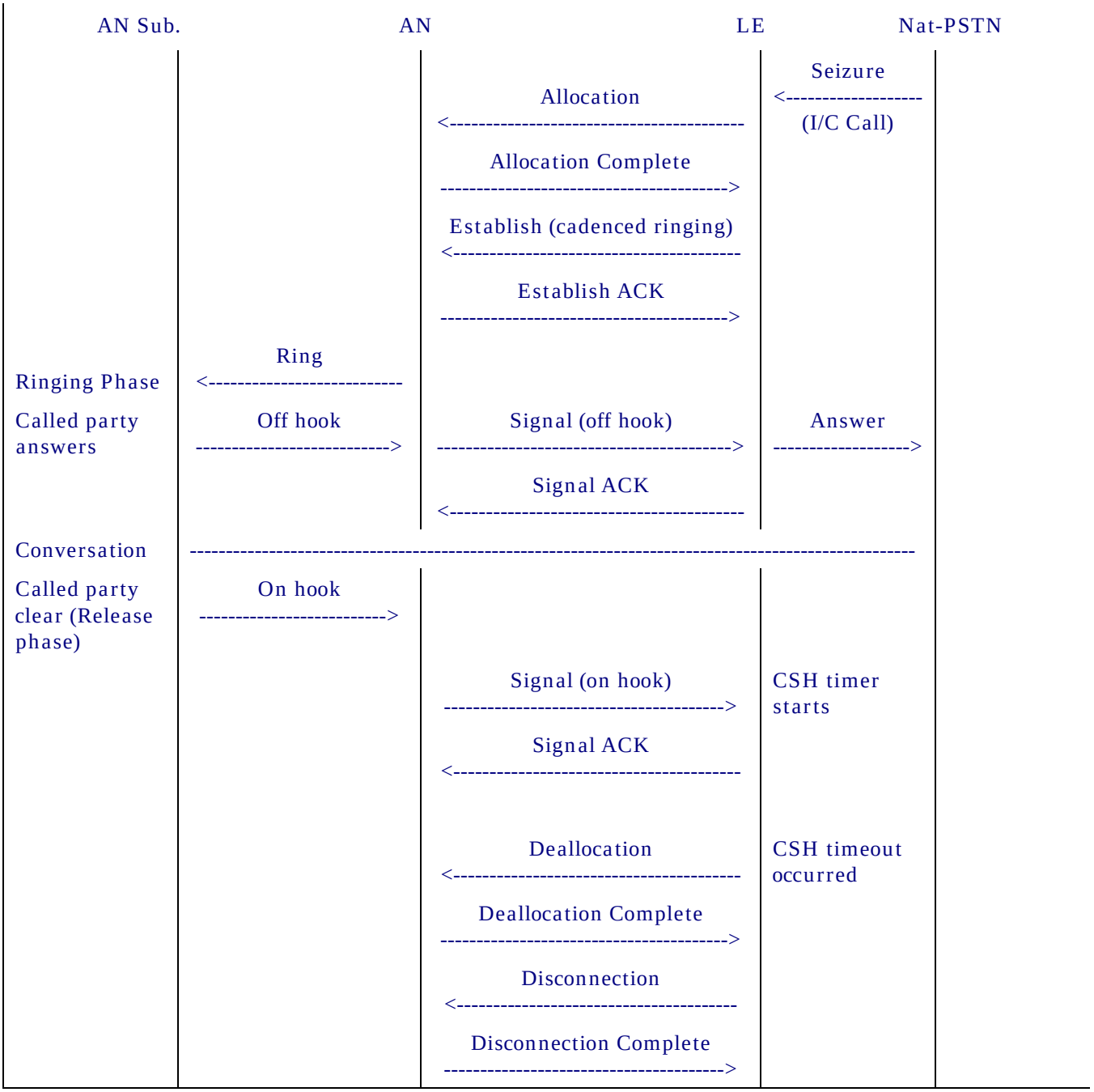
PSTN ORIGINATED CALL

(Calling Party Clears in Ringing)

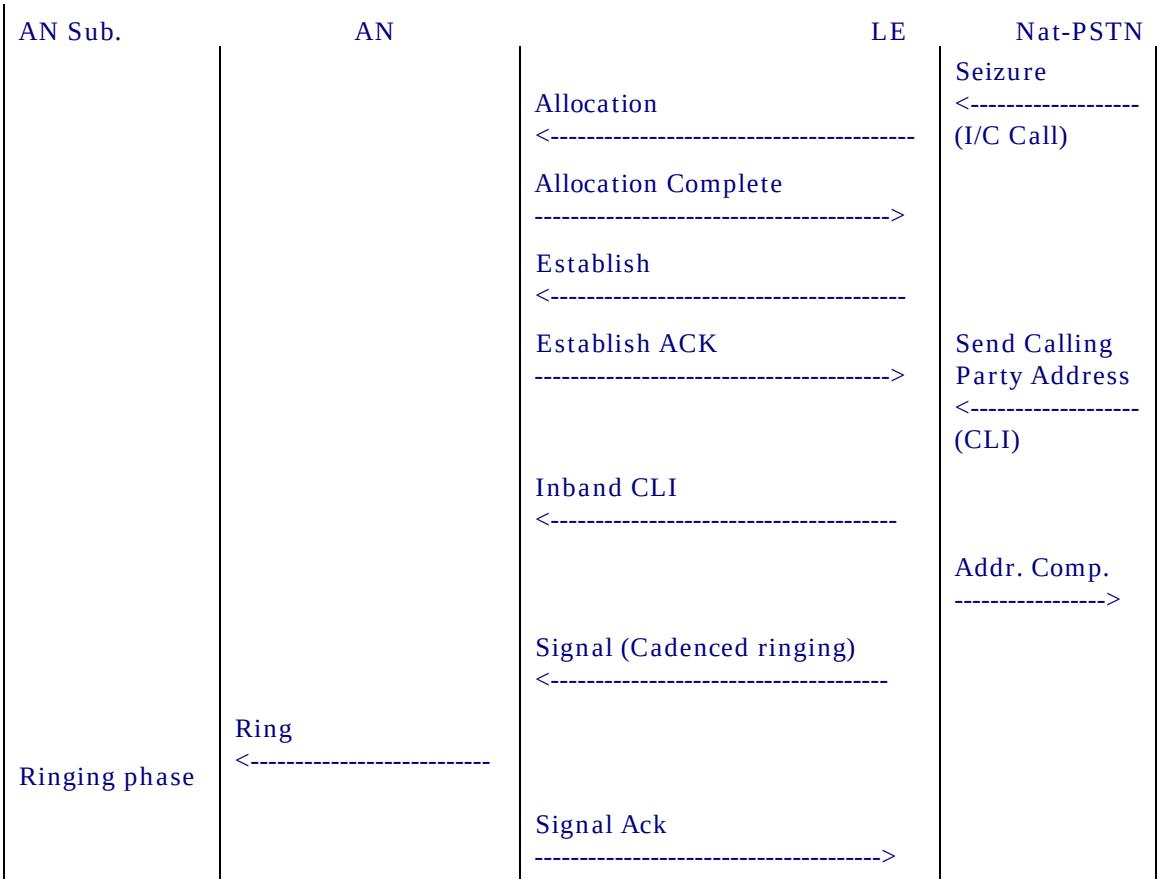


PSTN ORIGINATED CALL

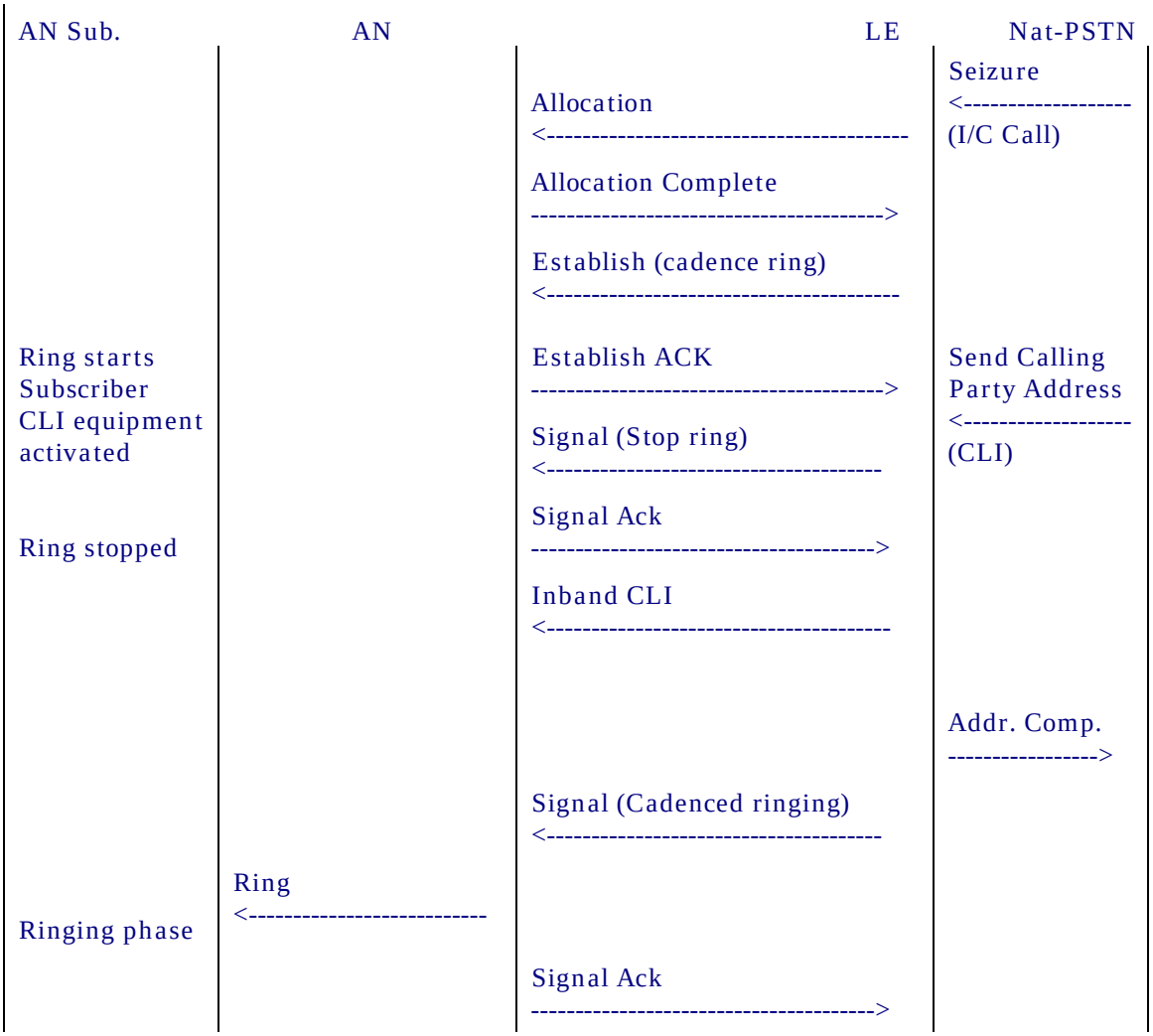
(Called Party Clears)



CALLER ID FEATURE METHOD 1



CALLER ID FEATURE METHOD 2



Rest of the steps are same as of …. (PSTN originated call).

Chapter 6.

Conversion and Installation Procedure

6.1. GENERAL

The objective of this chapter is to enable site personnel to convert existing C-DOT 256P RAX to AN-RAX. All the relevant details are provided in the following sections.

6.2. EXISTING 256P RAX CONFIGURATION

The hardware configuration of 256P RAX is shown in Figure 6.1.

The list of cards which become redundant and have to be removed are given in the table below

Card Name	Slots
RAT	M9, M18
RMF	M10, M17
CNF (if present)	M7
RSC	M12, M15, S12, S15
RAP	M13, M14
RDS	M21, S21
RDC	M24, S24
RWC	S10, S17
TWT	Where ever present
EMF	- do -
RDT	- do -

32 CH. PCM
TG 5
TG 6
COPY Ø
SLAVE
COPY 1
SLAVE
TG 7
TG 8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
SLAVE FRAME
MASTER FRAME
TG 1
TG 2
COPY Ø MASTER
COPY 1 MASTER
TG 3
TG 4
CARD DETAILS :
CNF : CONFERENCE CARD
PSU-I : POWER SUPPLY UNIT-I
RAP : RAX ADMINISTRATIVE PROCESSOR
RAT : RAX ANNOUNCEMENT AND TONE CARD
RMF : RAX MULTI FREQ. CARD
RSC : RAX SWITCH CONTROLLER CARD
RTC : RAX TERMINAL TEST CARD
RWC: RAX WLL CONTROLLER CARD
SPC / ISP: SIGNALLING PROCESSOR CARD / INTEGRATED SIGNALLING PROCESSING CARD
TC : LCC/TWT/EMF/RDT/CCM CARD
\DESIGNANRX-UMArgu-cf

FIG. 6.1

256P RAX CARD FRAME CONFIGURATION

The maintenance panel is also to be removed.

The list of cables which have to be completely removed from the system is given below:-

Sl. No.	Cable Marker No.	Signal Type Name	Source Placement Frame/Connector position	Destination Placement Frame/Connector position
1.	A800	E&M	Master Frame 3A (If present)	MDF
2.	A801	E&M	Master Frame 4A (If present)	MDF
3.	A802	E&M	Master Frame 5A (If present)	MDF
4.	A803	E&M	Master Frame 6A (If present)	MDF
5.	A804	E&M	Slave Frame 3A (If present)	MDF
6.	A805	E&M	Slave Frame 4A (If present)	MDF
7.	A806	E&M	Slave Frame 5A (If present)	MDF
8.	A807	E&M	Slave Frame 6A (If present)	MDF
9.	DT01	RDS-RDC (Pair) cable	Master Frame 21A (If present)	DDF
10.	MP00	MPACIA link	Master Frame, 2A Pos I	MP
11.	PRD1	-48V supply	PDT	MP
12.	DT02	RWC cable	Slave Frame, 10A and 17A (If present)	DDF
13.	DTNS	RNS Trunk cable	RNS (If present)	MDF
14.	CKC0 CLK0 SYN0	Clock & sync. Output for copy 0	RNS (If present)	RAP0 slot 13 A3 & 13 B 3
15.	CKC1 CLK1 SYN1	Clock & sync. Output for copy 1	RNS (If present)	RAP1 slot 14 A3 & 14B 3

6.3. MODIFICATION TO BE DONE ON MOTHERBOARD

6.3.1. Straps on Motherboard

The motherboard of 256P RAX has to be modified to enable installation of AN-RAX.

The Master frame will have 20 straps. The list of the strap is given in Table. The shrouds of slots 12A & 15A will have to be removed for new straps.

The Slave frame needs to have only four of the straps mentioned in the Table, but all the 20 straps may be done in slave frame to provide inter

changeability in future without major effort. The four straps are S.No. 17, 18, 19 and 20 of Strap List Table.

STRAP LIST FOR AN-RAX

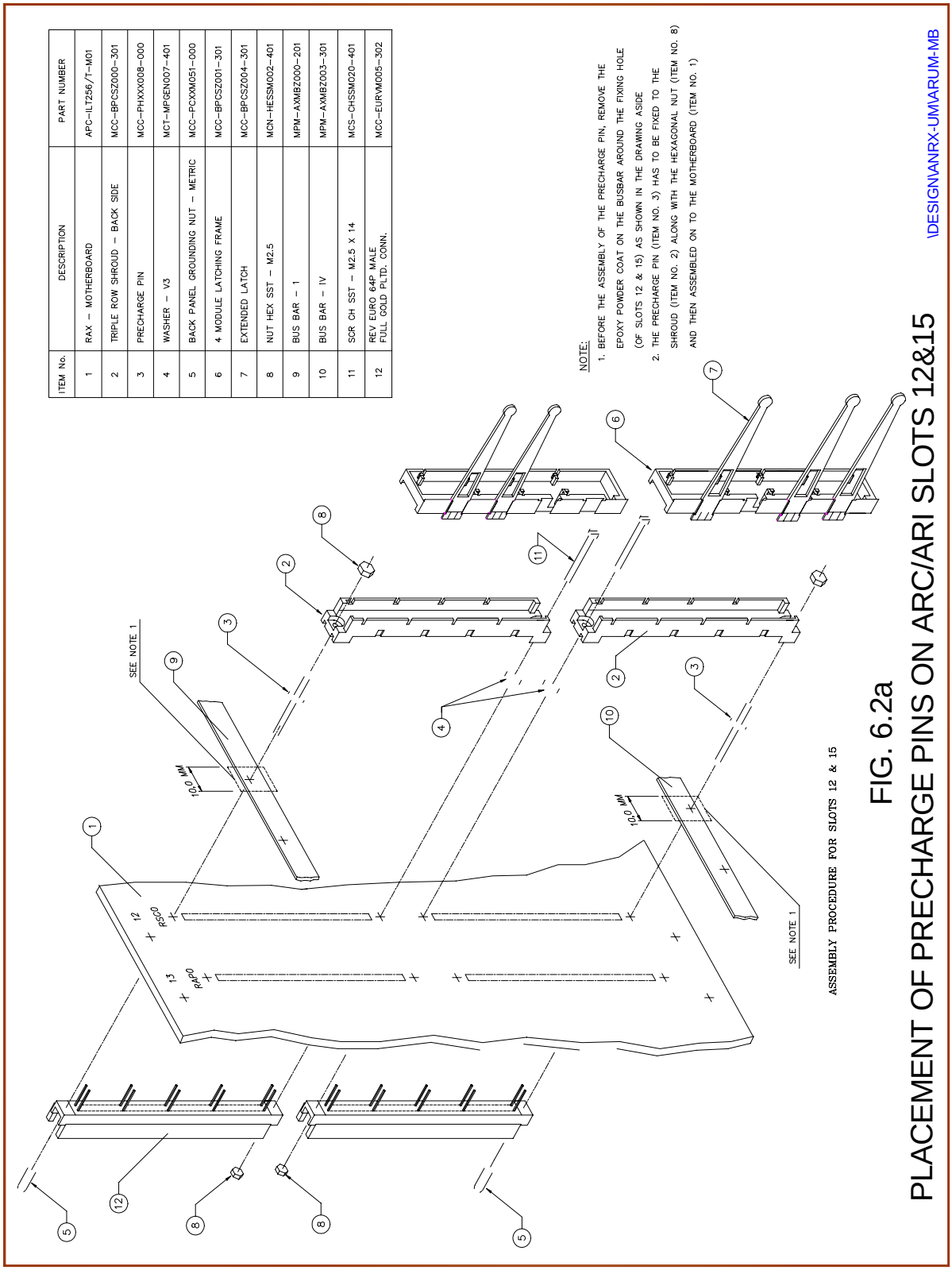
Sl. No.	Slot No. From	Pin No. To
1.	12/Ba8	15/Bc8
2.	12/Bc8	15/Ba8
3.	12/Ba9	15/Bc9
4.	12/Bc9	15/Ba9
5.	12/Aa9	15/Ac9
6.	12/Ac9	15/Aa9
7.	12/Ba2	15/Ba2
8.	12/Bc2	15/Bc2
9.	12/Ba3	15/Ba3
10.	12/Bc3	15/Bc3
11.	12/Ba4	15/Ba4
12.	12/Bc4	15/Bc4
13.	12/Ba5	15/Ba5
14.	12/Bc5	15/Bc5
15.	12/Ba23	15/Ba23
16.	12/Bc23	15/Bc23
17.	11/Ac6	16/Bc1
18.	11/Ac7	16/Ac9
19.	16/Ac6	11/Bc1
20.	16/Ac7	11/Ac9

6.3.2. Placement of Precharge Pins

The precharge pins and back panel grounding nuts have to be provisioned in the motherboard so that they make early contact with ARC/ARI cards as they are jacked in.

Two pre-charge pins have to be placed in each of the slots 12 & 15. These should replace the screws of the slot. See Figure 6.2a & 6.2b.

Back panel grounding nuts have to be provisioned on the motherboard for SPC/ISP card slots 11 & 16.


ITEM No. | DESCRIPTION | PART NUMBER
1 | RAX – MOTHERBOARD | APC–ILT256/T–M01
2 | TRIPLE ROW SHROUD – BACK SIDE | MCC–BPCSZ000–301
3 | PRECHARGE PIN | MCC–PHXXX008–000
4 | WASHER – V3 | MCT–MPGEN007–401
5 | BACK PANEL GROUNDING NUT – METRIC | MCC–PCXXM051–000
6 | 4 MODULE LATCHING FRAME | MCC–BPCSZ001–301
7 | EXTENDED LATCH | MCC–BPCSZ004–301
8 | NUT HEX SST – M2.5 | MCN–HESSM002–401
9 | BUS BAR – I | MPM–AXMBZ000–201
10 | BUS BAR – IV | MPM–AXMBZ003–301
11 | SCR CH SST – M2.5 X 14 | MCS–CHSSM020–401
12 | REV EURO 64P MALE FULL GOLD PLTD. CONN. | MCC–EURVM005–302
NOTE:
1. BEFORE THE ASSEMBLY OF THE PRECHARGE PIN, REMOVE THE EPOXY POWDER COAT ON THE BUSBAR AROUND THE FIXING HOLE (OF SLOTS 12 & 15) AS SHOWN IN THE DRAWING ASIDE
2. THE PRECHARGE PIN (ITEM NO. 3) HAS TO BE FIXED TO THE SHROUD (ITEM NO. 2) ALONG WITH THE HEXAGONAL NUT (ITEM NO. 8) AND THEN ASSEMBLED ON TO THE MOTHERBOARD (ITEM NO. 1)
SEE NOTE 1
10.0 MM
SEE NOTE 1
ASSEMBLY PROCEDURE FOR SLOTS 12 & 15
FIG. 6.2a
PLACEMENT OF PRECHARGE PINS ON ARC/ARI SLOTS 12&15
\DESIGN\ANRX-UM\ARUM-MB

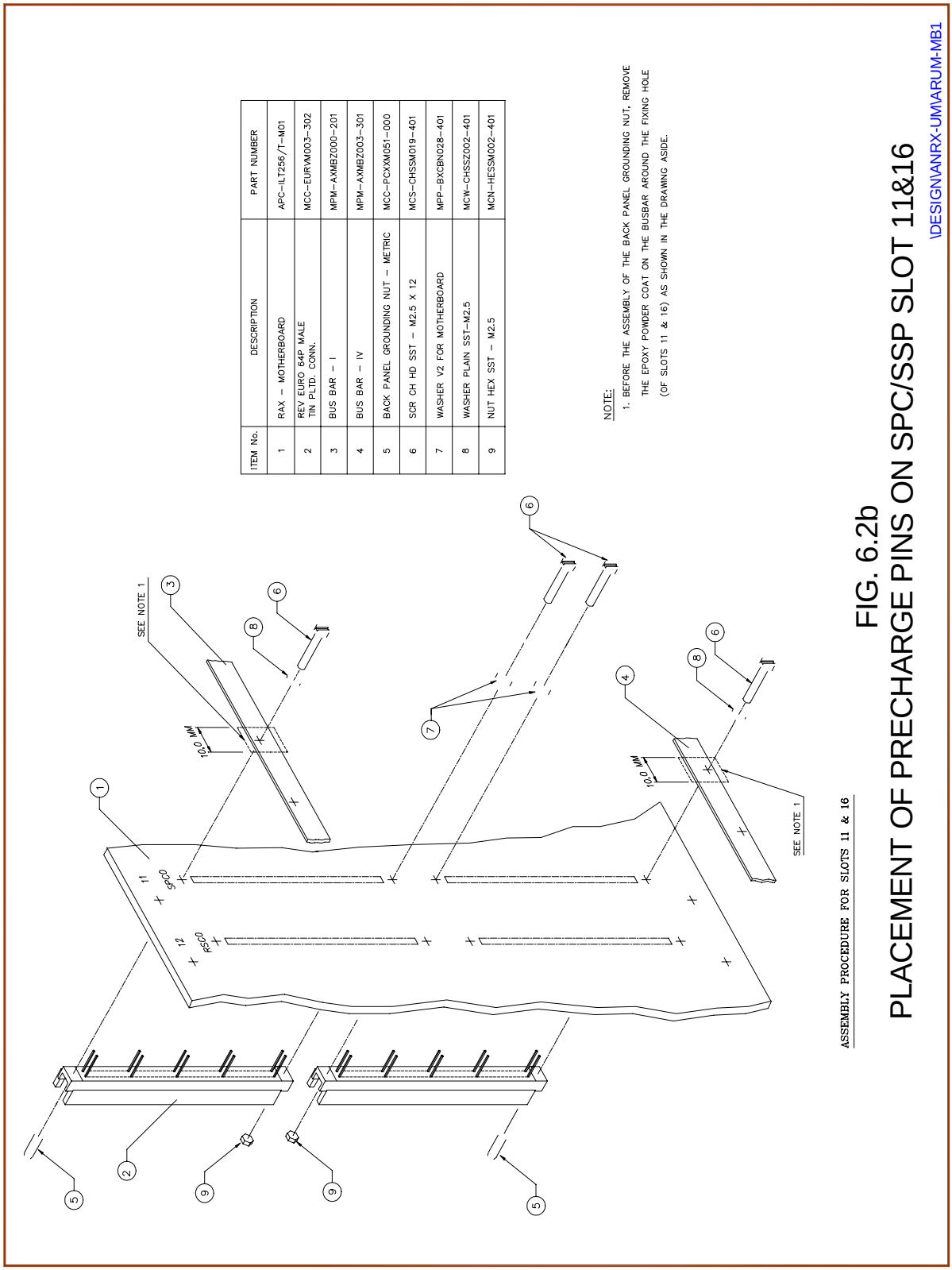

ITEM No. | DESCRIPTION | PART NUMBER
1 | RAX – MOTHERBOARD | APC–ILT256/T–M01
2 | REV EURO 64P MALE TIN PLTD. CONN. | MCC–EURVM003–302
3 | BUS BAR – I | MPM–AXMB2000–201
4 | BUS BAR – IV | MPM–AXMB2003–301
5 | BACK PANEL GROUNDING NUT – METRIC | MCC–PCXXM051–000
6 | SCR CH HD SST – M2.5 X 12 | MCS–CHSSM019–401
7 | WASHER V2 FOR MOTHERBOARD | MPP–BXCBN028–401
8 | WASHER PLAIN SST–M2.5 | MCW–CHSSZ002–401
9 | NUT HEX SST – M2.5 | MCN–HESSM002–401
NOTE:
1. BEFORE THE ASSEMBLY OF THE BACK PANEL GROUNDING NUT, REMOVE THE EPOXY POWDER COAT ON THE BUSBAR AROUND THE FIXING HOLE (OF SLOTS 11 & 16) AS SHOWN IN THE DRAWING ASIDE.
SEE NOTE 1
10.0 MM
SPC00
RSC00
SEE NOTE 1
ASSEMBLY PROCEDURE FOR SLOTS 11 & 16

FIG. 6.2b
PLACEMENT OF PRECHARGE PINS ON SPC/SSP SLOT 11&16

\DESIGN\ANRX-UMARUM-MB1

6.3.3. Placement of New Shrouds

Two shrouds have to be placed on the motherboard at location 12B & 15B in Master Frame only. The location is shown in Fig. 6.3.

However for interchangibility in future this can be done on slave frame also.

6.3.4. Jumper Setting on Motherboard for Configuring Motherboard for Master/Slave and 128/256 Port Mode

There are two set of 3 pin berg stick (Jumper pins) WS3 & WS4 on the back side of 256 port RAX mother board as shown in Fig. 6.4. Each Mother board of 256 port RAX can be configured for Master/Slave and 128/256 port mode by shorting these pin using shorting stubs.

(a) Jumper setting on each mother board for 256 port mode is to be done as shown below

		WS3	WS4
Slave frame	Short for Slave	.1 .2 .3	1. 2. 3. Short for 256 port mode
Master frame	Short for Master	.1 .2 .3	1. 2. 3. Short for 256 port mode

As seen from the back side (solder side of Mother board)

(b) For 128 port mode, jumper setting is to be done as shown below

	WS3	WS4
	.1	1.
Short for Master	.2 .3	2. Short for 128 port mode 3.

6.4. PLACEMENT OF CABLES ON MOTHERBOARD

6.4.1. Back Plane Interframe Cables

The five interframe cables are to be connected between Master and Slave frames.

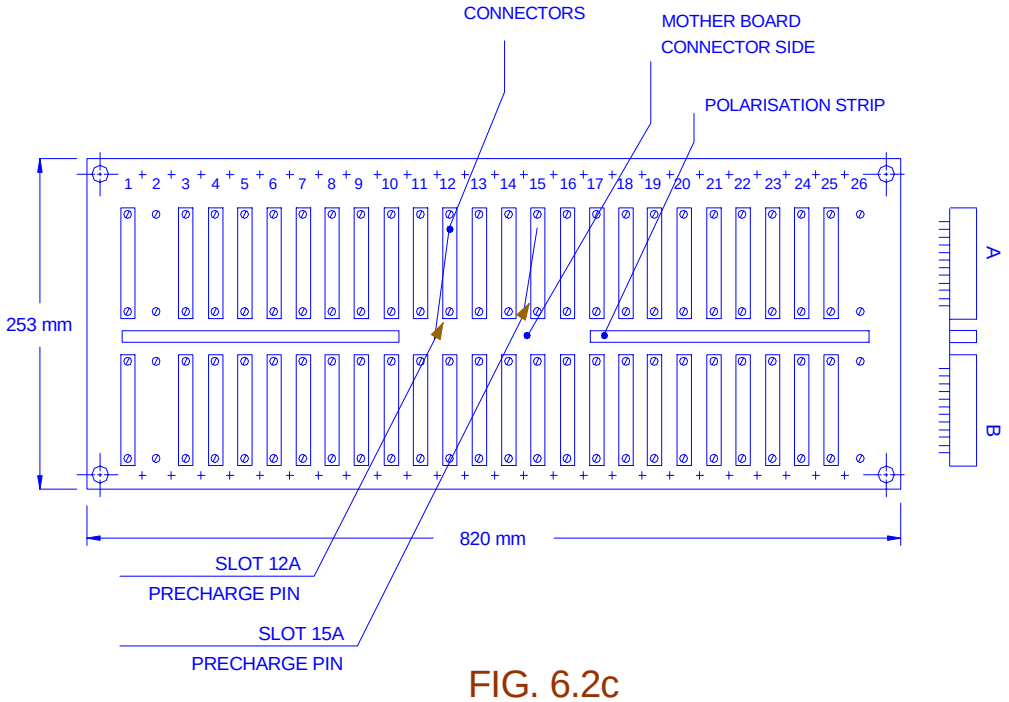


FIG. 6.2c

PLACEMENT OF PRE CHARGE PINS

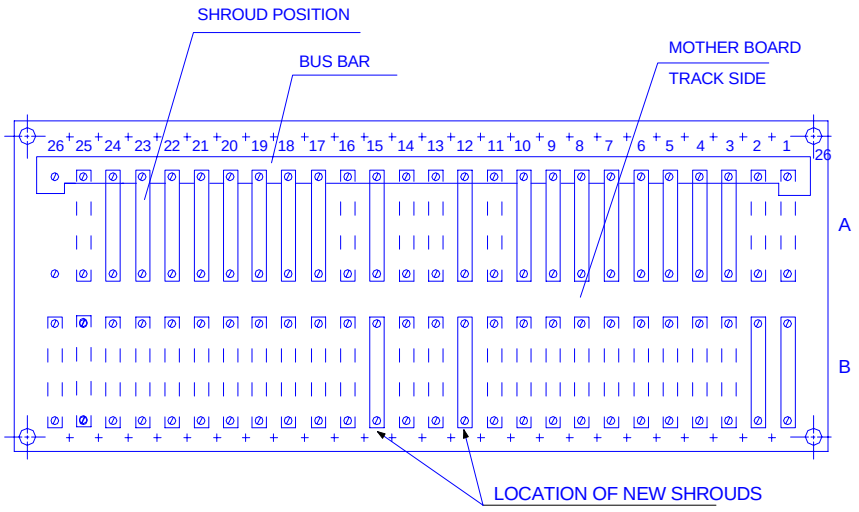

SHROUD POSITION
BUS BAR
MOTHER BOARD
TRACK SIDE
26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
26
A
B
LOCATION OF NEW SHROUDS

FIG. 6.3

PLACEMENT OF NEW SHROUDS

\DESIGN\ANRX-UM\Argu-crm

Sl. No.	Cable Marker No.	Source Placement Connector Position	Destination Placement Connector Position	Cable Description
1.	IFC0	Master Frame 12A, Pos II	Slave Frame 12A, Pos II	2 x 7 Flat cable connector
2.	IFC1	Master Frame 12A, Pos I	Slave Frame 12A, Pos I	- do -
3.	IFC2	Master Frame 15A, Pos II	Slave Frame 15A, Pos II	- do -
4.	IFC3	Master Frame 15A, Pos I	Slave Frame 15A, Pos I	- do -
5.	IFC4	Master Frame 2B, Pos I	Slave Frame 2B, Pos I	- do -

The connection details are shown in Fig. 6.5

6.4.2. Digital Link Cable

Digital link cable terminates two E1 links on the ARC card in one of the copies of Master Frame. The other end of the cable in terminated on the DDF (Digital Distribution Frame)

The details of the cable is given in table below

Cable Marker	Source Connector Position	Type	Destination Position	Type
DTC1	Master Frame 12B, Pos-I or Master Frame 15B, Pos-I	7 x 2 single Module connector	Digital Distribution Fame	Bare wire

The connection details are shown in fig. 6.6. The cable details are shown in fig. 6.7.

6.4.3. Dumb Terminal Cable

The dumb terminal cable is terminated on ARC card in slot 13B & 2A in Master Frame. The details of cable are given in table below.

Cable Marker Number	Source Connector Position	Type	Destination Connector Position	Type
SDT0	Master Frame 2A, Pos-I & 12B Pos-III	7 x 2 single Module cable	Dumb Terminal RS232-C connector	25-Pin D-type connector

The cable details and connector position on Master Frame are shown in figure 6.8 & figure 6.9.

Note: Before switching on the dumb terminal, it should be well checked that the earthing of the AC main supply and AN-RAX have been properly done.

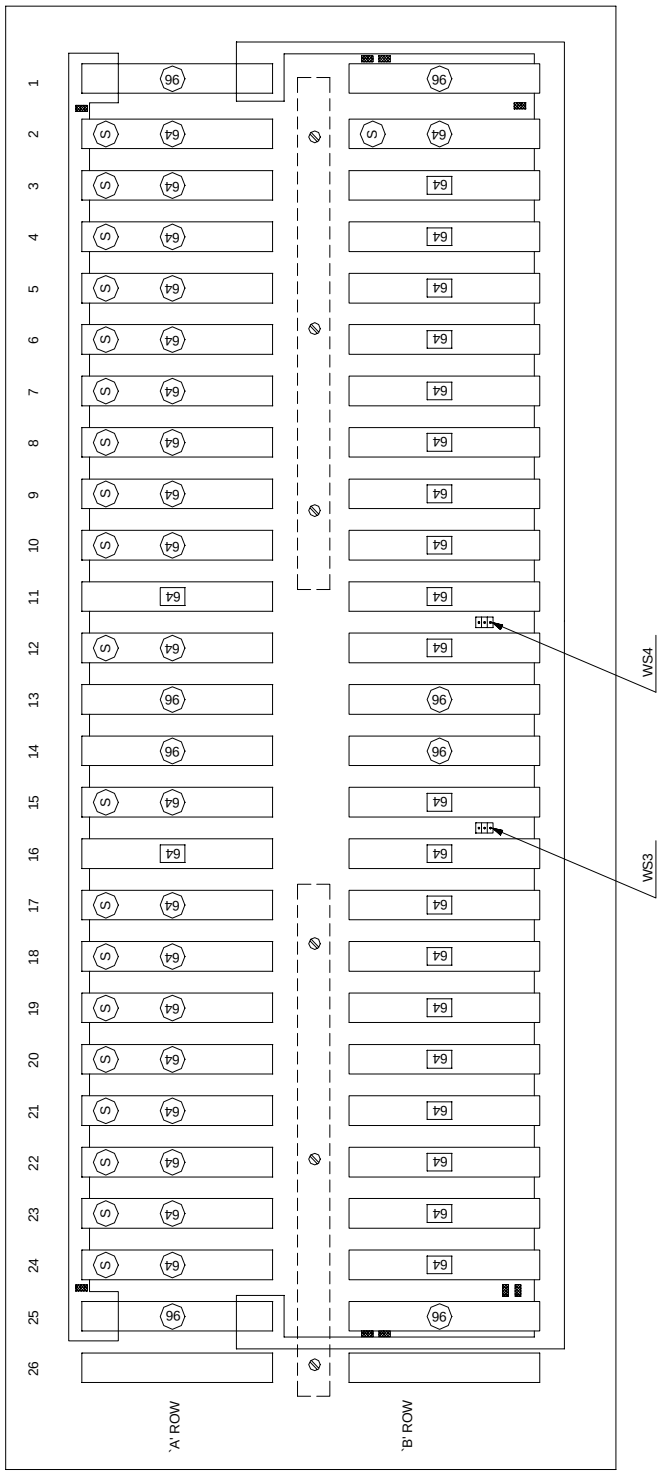


FIG. 6.4
JUMPER SETTING PINS ON MOTHER BOARD

\DESIGNANRX-UM\Argu-ma

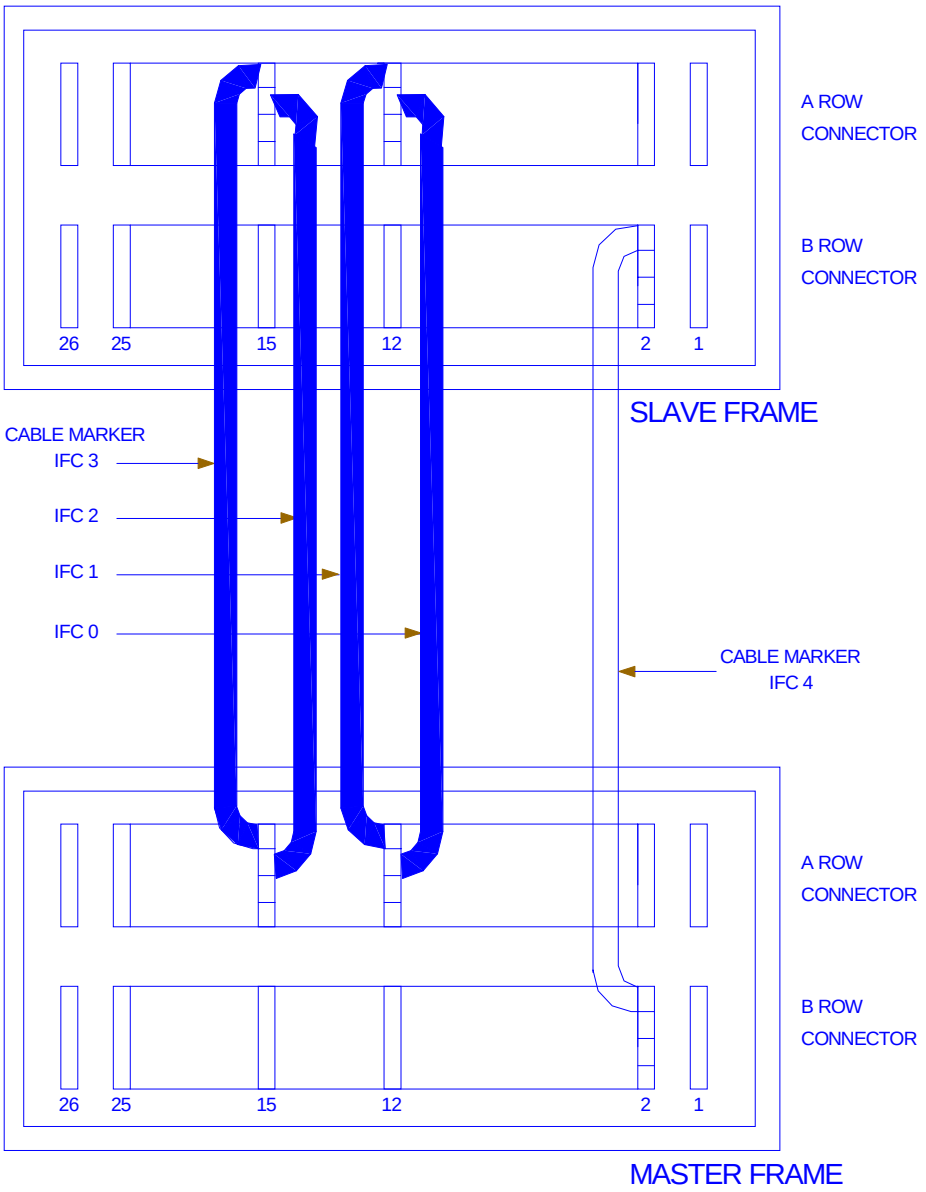


FIG. 6.5
INTER FRAME CABLES TERMINATION

\DESIGN\ANRX-UM\Argu-if

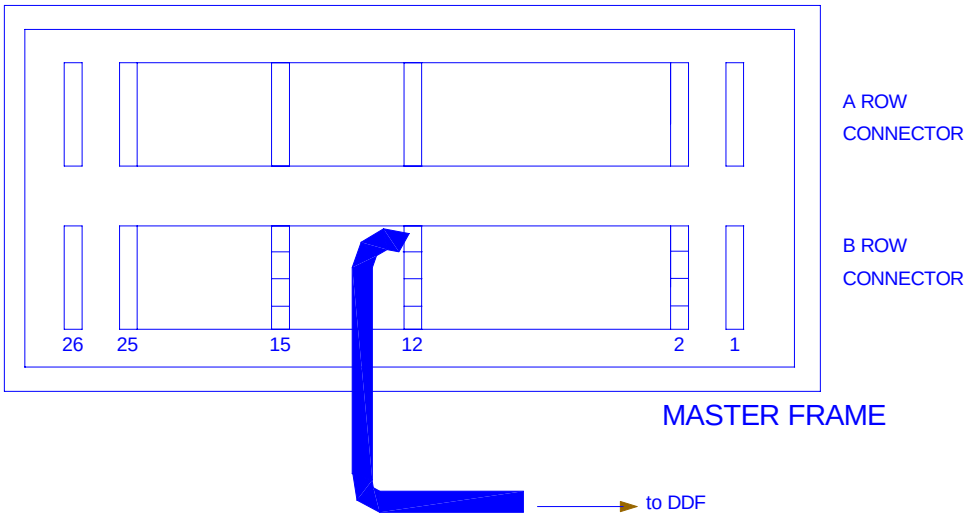
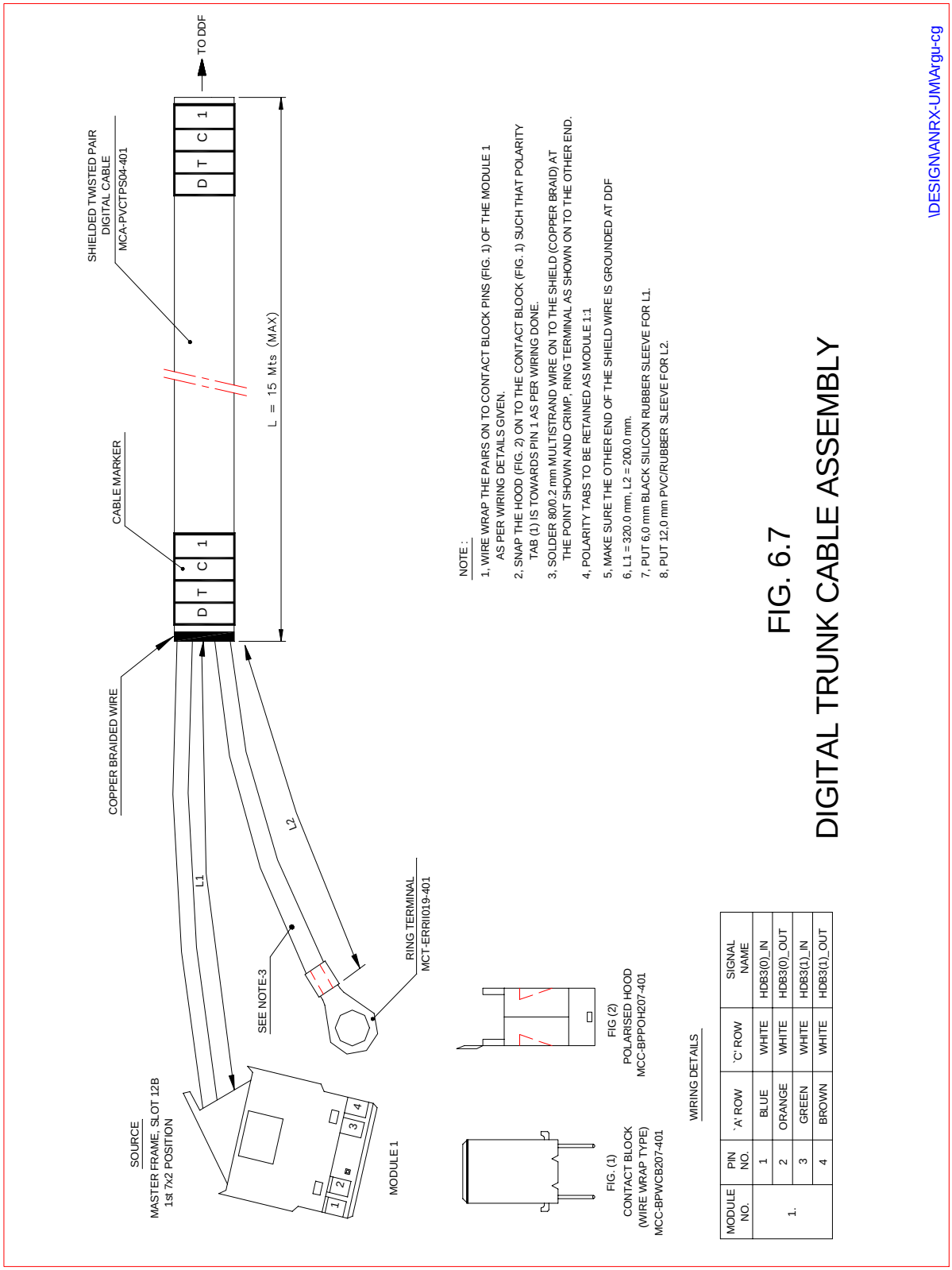


FIG. 6.6
DIGITAL LINK CABLE TERMINATION

\DESIGN\ANRX-UM\Argu-dlc


SHIELDED TWISTED PAIR
DIGITAL CABLE
MCA-PVCTPS04-401
TO DDF
D T C 1
D T C 1
CABLE MARKER
L = 15 Mts (MAX)
COPPER BRAIDED WIRE
L1
L2
SEE NOTE-3
RING TERMINAL
MCT-ERRII019-401
SOURCE
MASTER FRAME, SLOT 12B
1st 7x2 POSITION
MODULE 1
1
2
3
4
FIG. (1)
CONTACT BLOCK
(WIRE WRAP TYPE)
MCC-BPWCB207-401
FIG (2)
POLARISED HOOD
MCC-BPPOH207-401
NOTE :
1. WIRE WRAP THE PAIRS ON TO CONTACT BLOCK PINS (FIG. 1) OF THE MODULE 1 AS PER WIRING DETAILS GIVEN.
2. SNAP THE HOOD (FIG. 2) ON TO THE CONTACT BLOCK (FIG. 1) SUCH THAT POLARITY TAB (1) IS TOWARDS PIN 1 AS PER WIRING DONE.
3. SOLDER 80/0.2 mm MULTISTRAND WIRE ON TO THE SHIELD (COPPER BRAID) AT THE POINT SHOWN AND CRIMP, RING TERMINAL AS SHOWN ON TO THE OTHER END.
4. POLARITY TABS TO BE RETAINED AS MODULE 1:1
5. MAKE SURE THE OTHER END OF THE SHIELD WIRE IS GROUNDED AT DDF
6. L1 = 320.0 mm, L2 = 200.0 mm.
7. PUT 6,0 mm BLACK SILICON RUBBER SLEEVE FOR L1.
8. PUT 12,0 mm PVC/RUBBER SLEEVE FOR L2.
WIRING DETAILS
MODULE NO. | PIN NO. | 'A' ROW | 'C' ROW | SIGNAL NAME
1. | 1 | BLUE | WHITE | HDB3(0)_IN
2 | ORANGE | WHITE | HDB3(0)_OUT
3 | GREEN | WHITE | HDB3(1)_IN
4 | BROWN | WHITE | HDB3(1)_OUT
FIG. 6.7
DIGITAL TRUNK CABLE ASSEMBLY
\DESIGN\ANRX-UM\Argu-cg

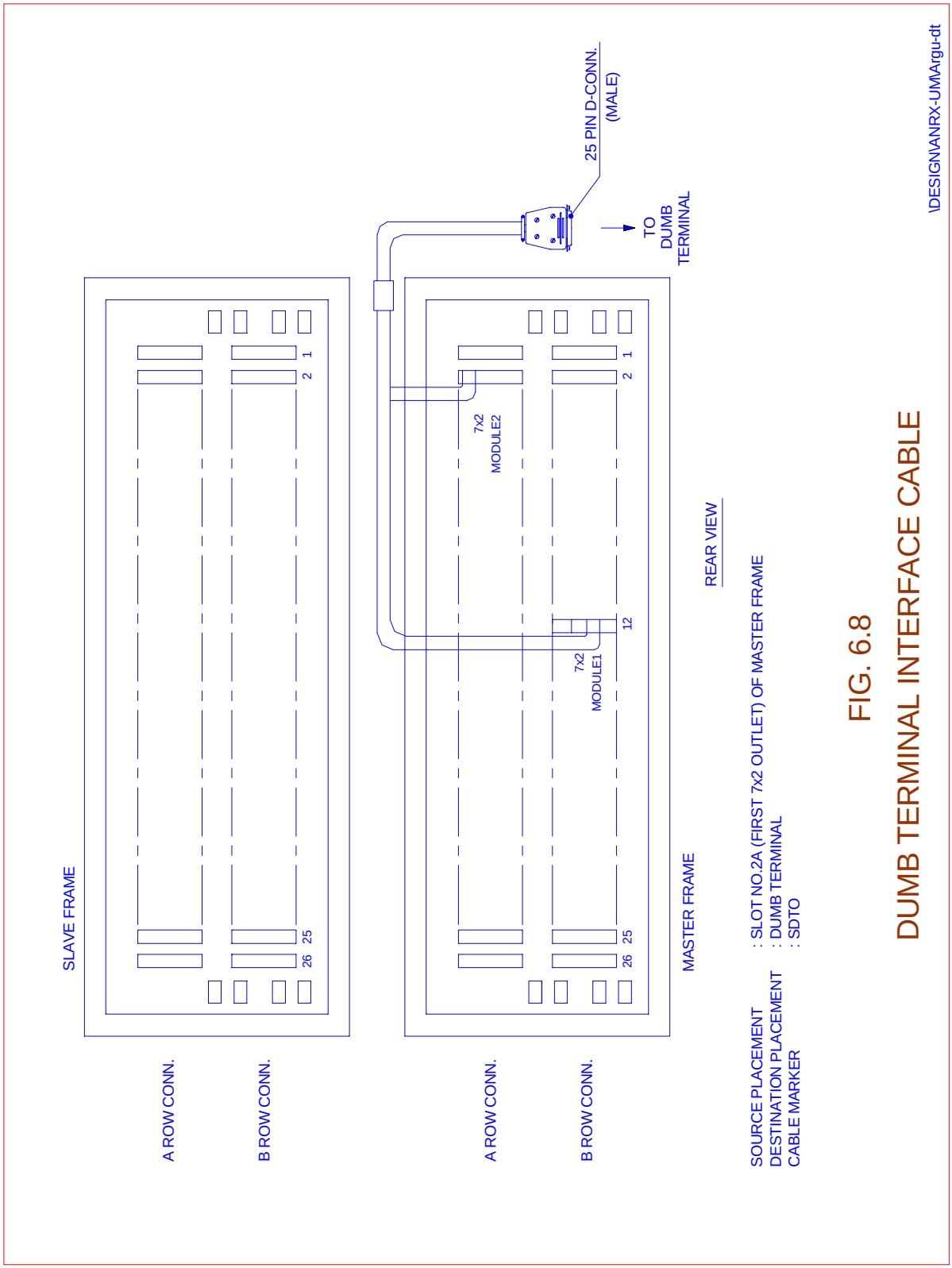
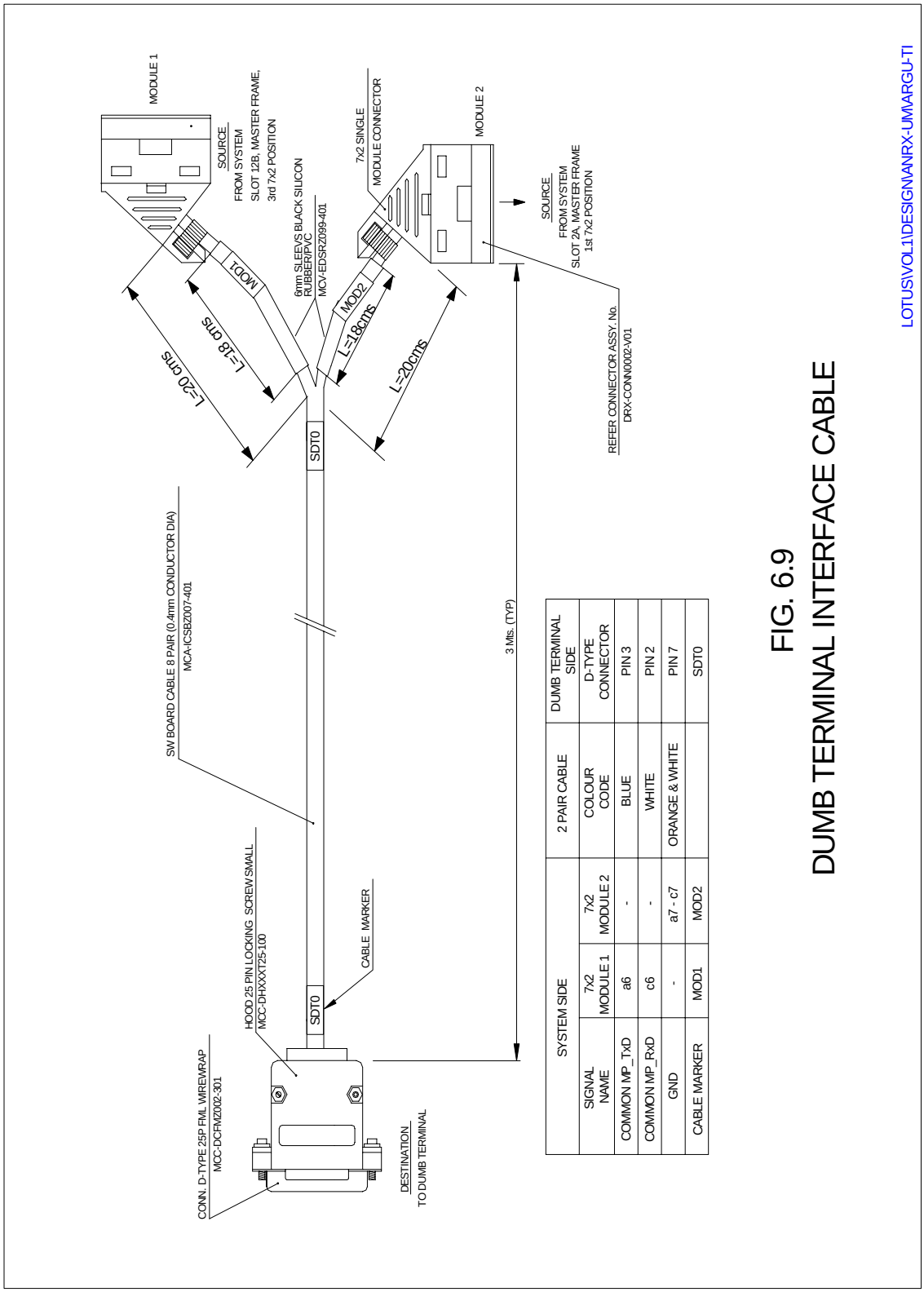


FIG. 6.8

DUMB TERMINAL INTERFACE CABLE



SYSTEM SIDE			2 PAIR CABLE	DUMB TERMINAL SIDE
SIGNAL NAME	7x2 MODULE 1	7x2 MODULE 2	COLOUR CODE	D-TYPE CONNECTOR
COMMON MP_TxD	a6	-	BLUE	PIN 3
COMMON MP_RxD	c6	-	WHITE	PIN 2
GND	-	a7 - c7	ORANGE & WHITE	PIN 7
CABLE MARKER	MOD1	MOD2		SDT0

FIG. 6.9
DUMB TERMINAL INTERFACE CABLE

LOTUS\VOL1\DESIGN\ANRX-UMARGU-TI

6.5. NEW HARDWARE

6.5.1. New Cards

The new hardware card for AN-RAX are listed in the table below :-

Card Name	Positions
AN-RAX Controller Card (ARC)	M12 & M15
AN-RAX Interface Card (ARI)	S12 & S15

The new hardware configuration is shown in figure 6.10.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
SLAVE	PSU0		TC	TC	TC	TC	TC	TC	TC	TC	SPC0	ARI0			ARI1	SPC1	TC	TC	TC	TC	TC	TC	TC	TC	PSU1	
MASTER	PSU0		TC	TC	TC	TC	TC	RTC/TC	TC	TC	SPC0	ARC0			ARC1	SPC1	TC	TC	TC	TC	TC	TC	TC	TC	PSU1	

TC : Termination Card i.e. LCC or CCM

Fig. 6.10 AN-RAX CARD FRAME CONFIGURATION

6.6. NEW CABLES

The ARC & ARI cards are connected by 60 pin flat cable from the front of the cards as shown in fig. 6.11.

The cable connection details are in table below.

Sl. No.	Cable Marker	Source Placement Position	Destination Connector Position
1.	ACI0	ARC FRONT, Master Frame slot 12	ARI FRONT, Slave Frame slot 12
2.	ACI1	ARC FRONT, Master Frame slot 15	ARI FRONT, Slave Frame slot 15

The flat cable is shown in fig. 6.12.

Sl. No.	Cable Marker	Source Connector Position	Destination Position
1.	ACI 0	ARC FRONT, Master Frame 12 Slot	ARI FRONT, Slave Frame 12 Slot
2.	ACI 1	ARC FRONT, Master Frame 15 Slot	ARI FRONT, Slave Frame 15 Slot

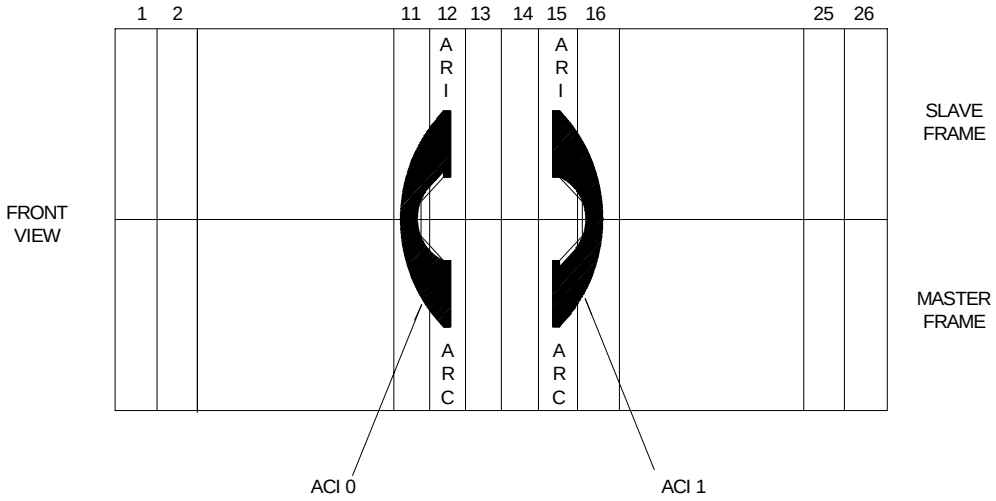


FIG. 6.11
CABLE CONNECTION BETWEEN ARC & ARI CARD

LOTUS\VOL1\DESIGN\ANRX-UM\ARGU-ACI

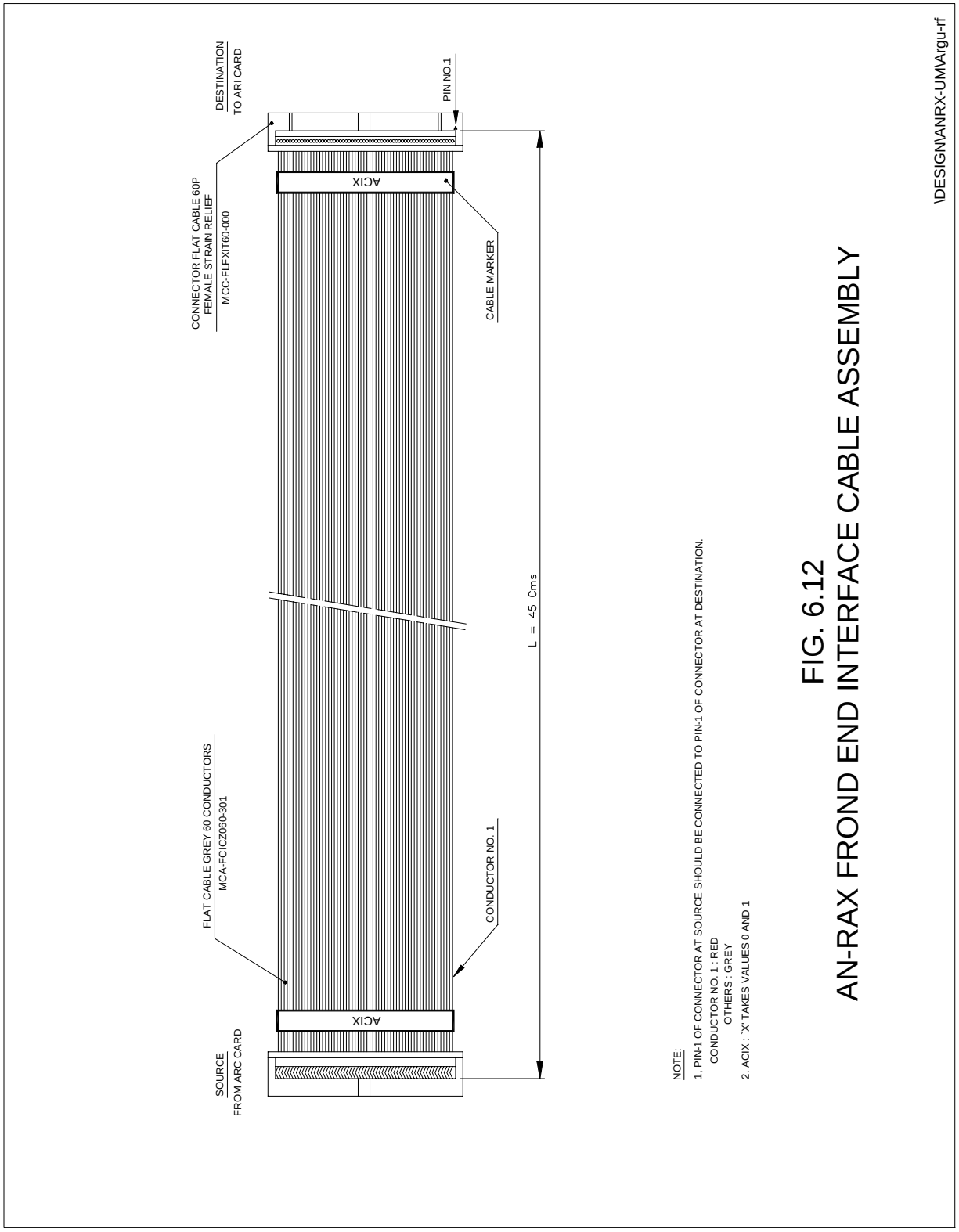


FIG. 6.12
AN-RAX FROND END INTERFACE CABLE ASSEMBLY

6.7. MAPPING OF L3 ADDRESSES TO AN-RAX HARDWARE SLOTS

The mapping of L3 addresses as defined at LE and AN to the actual hardware port of line cards is shown in the table below. It is being assumed that the `start L3 address' is 101 and all 248 possible subscribers are present.

S. No.	Card Slot	L3 Addresses
1	1-3	101-108
2	1-4	109-116
3	1-5	117-124
4	1-6	125-132
5	1-7	133-140
6	1-8 Note 1	141-148
7	1-9	149-156
8	1-10	157-164
9	1-17	165-172
10	1-18	173-180
11	1-19	181-188
12	1-20	189-196
13	1-21	197-204
14	1-22	205-212
15	1-23	213-220
16	1-24	221-228
17	2-3	229-236
18	2-4	237-244
19	2-5	245-252
20	2-6	253-260
21	2-7	261-268
22	2-8	269-276
23	2-9	277-284
24	2-10	285-292
25	2-17	293-300
26	2-18	301-308
27	2-19	309-316
28	2-20	317-324

S. No.	Card Slot	L3 Addresses
29	2-21	325-332
30	2-22	333-340
31	2-23	341-348
32	2-24	349-356

Note 1: *If an RTC card is placed in the slot, leave the corresponding 8 L3 addresses in sequence. The 8 L3 addresses should not be given to any subscriber. They should not be made in service at AN.*

Note 2: *If the start L3 address programmed at LE is 201, then the L3 address of slot 1-3 will begin from 201, slot 1-4 will begin 209 and so on.*

Chapter 7.

Man-Machine Interface

7.1. DESCRIPTION OF PARAMETERS

This section gives details of the parameters required for operation, maintenance and performance of AN interface. For each parameter, definition and the values it can take, have been given.

7.1.1. BOOT LEVEL

PARAMETER NAME	:	Type of booting during re-initialisation of AN-RAX
MNEMONIC	:	BOOT LEVEL
DEFINITION	:	This parameter defines the type of re-initialisation that is required for AN-RAX. The existing AN-RAX data can be reloaded or AN-RAX can start with default data.
TYPE	:	Numeric
POSSIBLE VALUES	:	1 – Boot using existing data 2 – Boot using default data
DEFAULT	:	None
REMARK	:	

7.1.2. CARD TYPE

PARAMETER NAME	:	Type of Card
MNEMONIC	:	CARD TYPE
DEFINITION	:	It defines the Hardware Type of Termination cards actually placed in the slot.
TYPE	:	alphanumeric
POSSIBLE VALUES	:	lcc - Line circuit card ccb - Coin collection box line card ccm - CCB with 16 KHz Metering pulse line card rtc - RAX Terminal Tester card
DEFAULT	:	
REMARK	:	rtc can be equipped only in slot 8

7.1.3. CDT START TIME

PARAMETER NAME	:	Calender Driven Test Start Time
MNEMONIC	:	CDT START TIME
DEFINITION	:	This parameter define the start time of Calender Driven Test
TYPE	:	hh : mm
POSSIBLE VALUES	:	00:00 to 23:59
DEFAULT	:	00:00
REMARK	:	

7.1.4. CDT STATE

PARAMETER NAME	:	Calender driven Test state
MNEMONIC	:	CDT STATE
DEFINITION	:	Used to enable or disable the Calender Driven Test which are executed automatically at the predefined time at AN-RAX.
TYPE	:	Numeric
POSSIBLE VALUES	:	0 – Disable 1 – Enable
DEFAULT	:	0
REMARK	:	

7.1.5. CONFIRM PASSWORD

PARAMETER NAME	:	Confirmation of New Password
MNEMONIC	:	CONFIRM PASSWORD
DEFINITION	:	Re-enter the new password, any 8 to 15 alphanumeric characters as enter in parameter New Password
POSSIBLE VALUES	:	Any alphanumeric Characters
DEFAULT	:	
REMARK	:	Entered characters are displayed as**

7.1.6. DATE

PARAMETER NAME	:	Date
MNEMONIC	:	DATE
DEFINITION	:	Date
TYPE	:	dd/mm/yyyy
POSSIBLE VALUES	:	01/01/2000 to 31/12/2099
DEFAULT	:	01/01/2000
REMARK	:	

7.1.7. FIRST PORT

PARAMETER NAME	:	L3 Address of Starting Port
MNEMONIC	:	FIRST PORT
DEFINITION	:	Specifies the Layer 3 address of the starting port for which Calendar Driven Test has to be executed
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 32756
DEFAULT	:	None
REMARK	:	

7.1.8. FRAME

PARAMETER NAME	:	Frame Number
MNEMONIC	:	FRAME
DEFINITION	:	It defines the Frame number i.e. Master or Slave.
TYPE	:	Numeric
POSSIBLE VALUES	:	1 - for Master frame 2 - for Slave frame
DEFAULT	:	
REMARK	:	

7.1.9. L3 ADDRESS

PARAMETER NAME	:	Layer three address
MNEMONIC	:	L3 ADDRESS
DEFINITION	:	It identifies the PSTN user port or a common control function.
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 32756
DEFAULT	:	
REMARK	:	

7.1.10. LAST PORT

PARAMETER NAME	:	L3 Address of Last Port
MNEMONIC	:	LAST PORT
DEFINITION	:	Specifies the Layer 3 address of the Last Port for which Calendar Driven Test has to be executed
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 32756
DEFAULT	:	255
REMARK	:	

7.1.11. LINK CONFIGURATION

PARAMETER NAME	:	AN Interface Link Configuration
MNEMONIC	:	LINK CONFIGURATION
DEFINITION	:	Gives the mapping of physical to a logical link id in the AI. When the links are being specified the physical and logical links are also to be given such that each physical link is given along with its logical link id onto which it is mapped and separated by a hyphen. Defined as PL-LL & PL-LL where PL is physical Link & LL is logical link.
TYPE	:	Numeric
POSSIBLE VALUES	:	For Phy links : 0 to 1 For Logical links : 0 to 255

7.1.12. NUMBER OF PORTS

PARAMETER NAME	:	Number of PSTN ports
MNEMONIC	:	NUMBER OF PORTS
DEFINITION	:	Identifies the no. of ports of a particular AN interface
TYPE	:	Numeric
POSSIBLE VALUES	:	Maximum of 256
DEFAULT	:	None

7.1.13. OLD PASSWORD

PARAMETER NAME	:	Old Password
MNEMONIC	:	OLD PASSWORD
DEFINITION	:	The currently active password is to be entered here.
TYPE	:	ALPHA NUMERIC
POSSIBLE VALUES	:	Upto maximum of 15 Alphanumeric character.
DEFAULT	:	
REMARK	:	

7.1.14. PRIMARY LINK

PARAMETER NAME	:	Primary Link
MNEMONIC	:	PRIMARY LINK
DEFINITION	:	Identifies the Primary link out of the links of AN interface. The logical link number is used to identify the AN interface link.
TYPE	:	Numeric
POSSIBLE VALUES	:	Same as for the parameter LINK CONFIGURATION (it should match the logical link id).
DEFAULT	:	None
REMARK	:	Always put value as '0'.

7.1.15. REPORT TYPE

PARAMETER NAME	:	Report Type
MNEMONIC	:	REPORT TYPE
DEFINITION	:	Type of Result for the routine test conducted on a port.
TYPE	:	Numeric
POSSIBLE VALUES	:	1. Aggregate result of all ports 2. Detailed result of each port 3. Aggregate result of all unsuccessful ports.
DEFAULT	:	
REMARK	:	

7.1.16. RINGING TYPE

PARAMETER NAME	:	Ring type to be fed to subscribers
MNEMONIC	:	RINGING TYPE
DEFINITION	:	Used to specify whether AN-RAX uses modified PSU for distinctive ringing or normal PSU for normal ring
TYPE	:	Numeric
POSSIBLE VALUES	:	1 – Distinctive Ring 2 – Normal Ring
DEFAULT	:	2
REMARK	:	

7.1.17. SECONDARY LINK

PARAMETER NAME	:	Secondary link
MNEMONIC	:	SECONDARY LINK
DEFINITION	:	Identifies the secondary link out of the links of AN interface. The logical link number is used to identifies the AN interface link.
TYPE	:	Numeric
POSSIBLE VALUES	:	Same as for the parameter LINK CONFIGURATION (it should match the logical link id)
DEFAULT	:	None
REMARK	:	Always Put value as ‘1’

7.1.18. SITE NAME

PARAMETER NAME	:	Site Name
MNEMONIC	:	SITE NAME
DEFINITION	:	Name of the site
TYPE	:	Alpha numeric
POSSIBLE VALUES	:	Maximum of 15 characters
DEFAULT	:	
REMARK	:	

7.1.19. SLOT

PARAMETER NAME	:	Card Slot Number
MNEMONIC	:	SLOT
DEFINITION	:	It identifies the physical slot of terminal card.
TYPE	:	Numeric
POSSIBLE VALUES	:	03 to 10, 17 to 24
DEFAULT	:	
REMARK	:	

7.1.20. STARTING L3 ADDR

PARAMETER NAME	:	Starting L3 Address
MNEMONIC	:	STARTING L3 ADDR
DEFINITION	:	Identifies the start L3 address of the range of L3 addresses valid for an AN interface.
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 32500
DEFAULT	:	None
REMARK	:	

7.1.21. TEST NUMBER

PARAMETER NAME	:	Test Set Number
MNEMONIC	:	TEST NUMBER
DEFINITION	:	It defines the Test set for testing of ports
TYPE	:	Numeric
POSSIBLE VALUES	:	101 - Exchange side Test 102 - Line Side Test 103 - Closed Loop Test
DEFAULT	:	
REMARK	:	

7.1.22. TIME

PARAMETER NAME	:	Time
MNEMONIC	:	TIME
DEFINITION	:	Time
TYPE	:	hh:mm:ss
POSSIBLE VALUES	:	00:00:00 to 23:59:59
DEFAULT	:	00:00:00
REMARK	:	

7.1.23. TYPE NEW PASSWORD

PARAMETER NAME	:	New Password
MNEMONIC	:	TYPE NEW PASSWORD
DEFINITION	:	The new password to be entered here.
TYPE	:	Alphanumeric
POSSIBLE VALUES	:	Minimum 8 and maximum 15, Alphanumeric characters
DEFAULT	:	
REMARK	:	

7.1.24. UNIT ID

PARAMETER NAME	:	Unit Identification
MNEMONIC	:	UNIT ID
DEFINITION	:	Identification of the unit for which alarm is to be displayed.
TYPE	:	Alphanumeric
POSSIBLE VALUES	:	dtk0 - V5 Link 01 dtk1 - V5 link 02 arcm0 - AN-RAX Controller copy 0 (Master) arcm1 - AN-RAX Controller copy 1 (Master) aris0 - AN-RAX Interface card copy 0 (Slave) aris1 - AN-RAX Interface card copy 1 (Slave) spcm0 - Signalling Processor Card copy 0 (Master) spcm1 - Signalling Processor Card copy 1 (Master) spcs0 - Signalling Processor Card copy 1 (Slave) spcs1 - Signalling Processor Card copy 1 (Slave) rtc - RAX Terminal Tester Card psum0 - Power Supply Unit copy 0 (Master) psum1 - Power Supply Unit copy 1 (Master) psus0 - Power Supply Unit copy 0 (Slave) psus1 - Power Supply Unit copy 1 (Slave) mlnk - Mate hdlc link
DEFAULT	:	
REMARK	:	

7.1.25. V5 INTERFACE ID

PARAMETER NAME	:	AN Interface Number
MNEMONIC	:	V5 INTERFACE ID
DEFINITION	:	It uniquely identifies an AN interface in AN-RAX
TYPE	:	Numeric
POSSIBLE VALUES	:	1 to 32767
DEFAULT	:	None
REMARK	:	This value should be same as defined at LE.

7.1.26. V5 INTERFACE NAME

PARAMETER NAME	:	AN Interface Link Name
MNEMONIC	:	V5 INTERFACE NAME
DEFINITION	:	Identifies uniquely an AN interface
TYPE	:	Alphanumeric
POSSIBLE VALUES	:	At most 15 characters long name. It can have alphanumerals including hyphens but can not start or end with hyphen.
DEFAULT	:	None
REMARK	:	-

7.1.27. V5 LINK

PARAMETER NAME	:	Link Identification
MNEMONIC	:	V5 LINK
DEFINITION	:	It is the identifier for physical DTK.
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 1
DEFAULT	:	None
REMARK	:	-

7.1.28. VARIANT ID

PARAMETER NAME	:	Variant Identification
MNEMONIC	:	VARIANT ID
DEFINITION	:	It identifies an independent set of AN interface selected data. Different sets are given different variant ids.
TYPE	:	Numeric
POSSIBLE VALUES	:	0 to 127
DEFAULT	:	None
REMARK	:	The variant id for a working AN interface must have the same value at LE and AN ends.

7.2. AN-RAX ADMINISTRATION & MAINTENANCE COMMANDS LIST

7.2.1. Interface related Administration Commands

1. CRE-AI
2. DEL-AI
3. DISPL-AI-CHAR
4. DISPL-AI-STATUS
5. START-AI

7.2.1.1. CRE-AI (Create AN Interface)

Description :

This command is used for configuring an AN interface (V5.2). When the system is powered on for the first time it is required that the AN provisioning data is provided.

Input Form :

C-DOT AN-RAX <Site id>

CRE-AI CREATE AN INTERFACE

V5 INTERFACE ID :
V5 INTERFACE NAME :
VARIANT ID :
STARTING L3 ADDR :
NUMBER OF PORTS :
LINK CONFIGURATION :
PRIMARY LINK :
SECONDARY LINK :

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        CRE-AI      CREATE AN INTERFACE REPORT

RESULT                  : SUCCESSFULL
```

- If RESULT is failure, one more field REASON will appear citing cause for it.

Failure Reasons :

1. Record Already exists
2. Variant Already exists
3. Invalid Interface ID
4. Invalid Variant ID
5. Invalid number of ports
6. Invalid starting L3 address
7. Invalid Link configuration
8. Invalid Primary Link
9. Invalid Secondary Link

Note :

For Primary Link always put value as ϕ and for secondary link it should be 1.

7.2.1.2. DEL-AI (Delete AN Interface)

Description:

When there is necessity to change the provisioning data, before an AN interface is started after creating it, the AN interface can be deleted and recreated.

Input Form: None

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                          DELETE INTERFACE REPORT:


RESULT                : Success
```

* The REASON field appears only when RESULT is failure.

Note:

If the interface can not be deleted, the failure is reported with REASON as either "INTERFACE RUNNING" if interface is created and traffic has already started on it or "INTERFACE NOT KNOWN" if it is not created with given AI-NUM.

7.2.1.3. DISPL-AI-CHAR (Display AI Characteristics)

Description:

This command can be used to display the AN interface characteristics.

Input Form: None

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

      DISPL_AI_CHAR      DISPLAY AN INTERFACE CHARACTERISTICS

V5 INTERFACE ID                :
V5 INTERFACE NAME              :
VARIANT ID                     :
STARTING L3 ADDR               :
NUMBER OF PORTS                :
LINK CONFIGURATION             :
PRIMARY LINK                   :
SECONDARY LINK                 :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 01:55:50 MORE STATUS : # HELP : ?
```

7.2.1.4. DISPL-AI-STATUS (Display AN Interface)

Description:

The command is used to display the status of AI interface.

Input Form: None

Output Form :

Following is the output report displayed after successful execution of command.

C-DOT AN-RAX <Site id>

AN INTERFACE STATUS REPORT :

AN INTERFACE ID	:
AN INTERFACE NAME	:
VARIANT ID	:
NUMBER OF LINKS	:
V5L0 LINK STATUS	:
V5L1 LINK STATUS	:
AN INTERFACE STATUS	:

Failure Reason:

1. No Interface Record

   The status can be either “INTERFACE DOWN”, “SYSTEM START UP”, “VARIANT VARIFICATION”, “PSTN RRESTART”, “OPERATIONAL”, “INTERFACE NOT CREATED” OR “TRANSIENT”.

Note: 1. Link status is not displayed if interface status is not operational

2. Link status can be ACT, SBY, UP or DN.

7.2.1.5. START-AI (Start AN Interface)

Description :

After creating the AN interface this command is given to start the interface.

Input Form : None

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        START AN INTERFACE REPORT:


RESULT          :
* [REASON]      :
```

* If RESULT is failure, REASON field appears stating cause for failure.

The possible failure reasons are:

1. Interface already running.
2. No Interface Record
3. Variant/Interface ID not matched
4. No response from LE
5. All Links are Blocked by operator

7.2.2. General Administration Commands

1. CRE-SITE-ID
2. EQUIP-SLOT
3. LOGOUT
4. MOD-DATE-TIME
5. MOD-PSU
6. PASSWD
7. UNEQUIP-SLOT

7.2.2.1. CRE-SITE-ID (Set the Site Name)

Description :

This command is used to give a site name to AN-RAX which appears at top right hand side of console screen.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

        CRE-SITE-ID    Registering Site Name

    SITE NAME                :        PUSA-2
```

Output Form :

```
C-DOT AN-RAX                                                    <Pusa-2>

                        cre-site-id    Registering Site Name

RESULT                  : SUCCESSFULL
```

Failure reasons:

1. Name may exceed maximum number of characters.

7.2.2.2. EQUIP-SLOT (Equip a Slot)

Description :

This command is used to configure a physical slot for a particular card type.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

     EQUIP-SLOT      EQUIP The card in the Slot


FRAME                    :
SLOT                     :
CARD TYPE                :
```

Output Form :

Following is the output report displayed after successful execution of command.

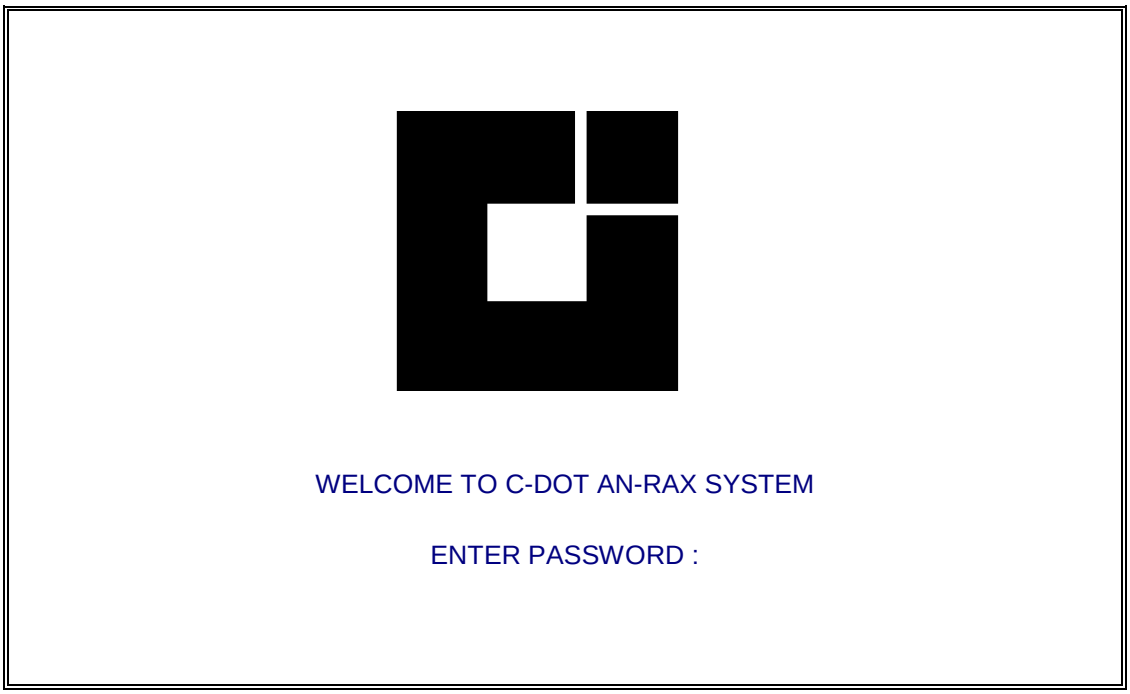
```
C-DOT AN-RAX                                                    <Site id>

                    Equip-slot      EQUIP The Card in the Slot


FRAME               :

SLOT                :

RESULT              :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 00:17:05 MORE STATUS : # HELP : ?
```

- If the command fails result field will be displayed as "SLOT IS ALREADY EQUIPPED", “INVALID FRAME”, or “INVALID SLOT”.

7.2.2.3. LOGOUT (For Logout)

Description :

When the operator wants to logout of the RLC this command is to be given. This command causes the MMI to prompt for the password and the screen appears as below :



7.2.2.4. MOD-DATE-TIME (Modify Date & Time)

Description: This command is used to change the system date and time.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

        MOD-DATE-TIME       (Modify Date Time)

Existing Values :
Date                :       01/01/2001, Monday
Time                :       20:54:21

Modified Values :

Date                :
Time                :
```

Output Form :

```
C-DOT AN-RAX                                                    <Site id>

            Mod-date-time       Modify Date Time


Result              : Successful


_____________________________________________________________________

256 Port 15/05/2002, Wednesday 12:01:15       MORE STATUS : # HELP : ?
```

Possible Failure reasons are:

1. Invalid Date.
2. Invalid Time.

7.2.2.5. MOD-PSU (MODIFY POWER SUPPLY TYPE)

Description :

This command is used for selecting distinctive ringing or normal ringing.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

                    MOD-PSU      CHANGE PSU RINGING TYPE

    EXISTING VALUES :

    RINGING TYPE          : 1

    MODIFIED VALUES :

    RINGING TYPE          :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                    MOD-PSU      CHANGE PSU RINGING TYPE



    RESULT                : SUCCESSFULL
```

7.2.2.6. PASSWD (To Change Password)

Description :

This command is used to change password.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

            PASSWD          CHANGE PASSWORD

OLD PASSWORD                    :
TYPE NEW PASSWORD               :
CONFIRM PASSWORD                :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>


RESULT : SUCCESS
```

The Failure reasons can be:

1. Invalid old Password.
2. New values do not match.

7.2.2.7. UNEQUIP-SLOT (Unequip a Slot)

Description :

This command is used to unequip a physical slot.

Input Form :

C-DOT AN-RAX **<Site id>**

unequip-slot Unequip The Card From The Slot

Frame :

Slot :

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                    Unequip-Slot    Unequip The Card From The Slot


FRAME                    :
SLOT                     :
RESULT                   :


_____________________________________________________________________

256 Port 01/01/2000, Saturday 19:31:12 MORE STATUS : # HELP : ?
```

* If the result is a failure the report will be displayed as :-

```
C-DOT AN-RAX                                                    <Site id>

                    Unequip-Slot    Unequip The Card From The Slot


RESULT              :       FAIL
REASON              :


_____________________________________________________________________

256 Port 01/01/2000, Saturday 19:31:12 MORE STATUS : # HELP : ?
```

Note :* *Reason for failure could "SLOT IS NOT EQUIPPED" "INVALID FRAME" OR "INVALID SLOT".*

7.2.3. Maintenance Commands

1. DGN-RTC
2. DISPL-AICNT-OOS
3. DISPL-ALRM-HIST
4. DISPL-DTK-STATUS
5. DISPL-SLOT
6. DISPL-TRM-STATUS
7. DISPL-TST-LOG
8. FRC-DTK-OOS
9. FRC-TRM-INS
10. FRC-TRM-OOS
11. INIT-SYS
12. MOD-CDT-CHAR
13. MOD-CDT-STATE
14. PUT-DTK-INS
15. PUT-DTK-OOS
16. PUT-TRM-INS
17. PUT-TRM-OOS
18. SWITCH-OVER
19. TST-ABORT
20. TST-DTK
21. TST-TRM

7.2.3.1. DGN-RTC (Diagnosis of RTC Card)

Description :

This command is used to test the RTC card.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>




Executing……
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                          RTC IDLE TIME TEST RESULT

Aggregate Result          :

Fuse Test                 :

Current Source 1 Result   :

Current source 2 Result   :

RTC-ARC Voice Path test   :
```

7.2.3.2. DISPL-AICNT-OOS (Display AI Ports Out of Service)

Description :

This command gives number of ports under various status.

Input Form : None

Output Form :

Following is the output report displayed after successful execution of command.

C-DOT AN-RAX **<Site id>**

displ-aicnt-oos Display Port Status Statistics

INS PORTS	OOS PORTS	BLK PORTS	UEQ PORTS	FOOS PORTS	MTCE PORTS
6	6	0	208	36	0

256 Port 01/01/2000, Saturday 02:40:16 MORE STATUS : # HELP : ?

7.2.3.3. DISPL-ALRM-HIST (Display Alarm History)

Description: This command is used to display the history of alarms that are occurred in the system over a span of time.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

        DISPL-ALRM-HIST      (DISPLAY ALARM HISTORY)


UNIT-ID          :
```

Output Form :

```
C-DOT AN-RAX                                                    <Site id>

Displ-alarm-hist          Display Alarm History

                          Alarm history of the Unit : arcm0

DATE                TIME OCCURRED          STATUS      SEVERITY

01/01/2001          19:54:58               ACT         MAJOR

01/01/2001          19:54:30               IS          MAJOR

_____________________________________________________________________

256 Port 01/01/2000, Monday 20:23:06 MORE STATUS : # HELP : ?
```

The Failure Reasons are:

1. Invalid Unit id.

7.2.3.4. DISPL-DTK-STATUS (Display Trunk Status)

Description:

This command is used to know status of digital trunk.

Input Form:

```
C-DOT AN-RAX                                                    <Site id>

              DISPL-DTK-STATUS        DISPLAY DIGITAL TRUNK STATUS

V5 LINK                       :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

              displ-dtk-status        Display Digital Trunk Status


V5 Link       :
STATUS        :
```

Failure Reasons:

1. Invalid V5 Link ID.

7.2.3.5. DISPL-SLOT (DISPLAY SLOT)

Description :

This command gives the type of card and status of card present in the specified slot.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

                    DISPL-SOT     DISPLAY CARD-SLOT DATA

    FRAME                 :

    SLOT                  :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                    DISPL-SOT     DISPLAY CARD-SLOT DATA

    FRAME           :

    SLOT            :

    CARD TYPE       :

    STATUS          :
```

Failure Reasons:

1. Invalid Frame
2. Invalid Slot

7.2.3.6. DISPL-TRM-STATUS (Display TRM Status)

Description:

This command will display the port status for an AN interface.

Input Form:

```
C-DOT AN-RAX                                                    <Site id>

          DISPL-TRM-STATUS        DISPLAY TERMINAL STATUS

L3 ADDRESS                  :

_____________________________________________________________________
```

Note :

Range of L3 Addresses can be given.

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        DISPLAY PORT STATUS REPORT

L3-ADDRESS                          STATUS


_____________________________________________________________________

256 Port 01/01/2000, Saturday 02:09:58 MORE STATUS : # HELP : ?
```

Failure Reasons: Invalid L3 address

Note :

1. *The status of the terminal could be "UEQ", "INS", "OOS", "FOOS" or "BLKED".*

7.2.3.7. DISPL-TST-LOG (Display Report of TST-TRM)

Description :

This command is used to display results of the terminal tests conducted during the last calender driven testing.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

     DISPL-TST-LOG        TEST RESULT LAST CONDUCTED


REPORT TYPE :
```

Output Form :

Following is the output report displayed after successful execution of the command.

```
C-DOT AN-RAX                                                    <Site id>

[Various output reports are displayed depending upon input parameter given.]
```

Failure Reasons:

1. Invalid L3 address
2. Invalid Report Type.

7.2.3.8. FRC-DTK-OOS (Force Trunk Out of Service)

Description :

This command shall be used to force digital link out of service.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

              FRC-DTK-OOS      FORCE DIGITAL TRUNK OUT OF SERVICE

V5 LINK                :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        FORCE LINK OUT OF SERVICE REPORT

LINK ID                :
RESULT                 :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 03:30:26 MORE STATUS : # HELP : ?
```

Failure Reasons:

1. Invalid V5 Link ID
2. Link is already forced out.

Note: The link will be physically disconnected from LE.

7.2.3.9. FRC-TRM-INS (FORCE TERMINAL IN SERVICE)

Description :

This command is used for bringing the terminals in-service without testing them.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

                    Frc-trm-ins     FORCE TERMINAL IN SERVICE


   L3 ADDRESS                   :
```

Note: Range of L3 address can be given.

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                    Frc-trm-ins     FORCE TERMINAL IN SERVICE

   L3 ADDRESS               :

   RESPONSE                 : SUCCESS
```

Failure Reasons:

1. Invalid L3 address.
2. Port is unequipped
3. Interface down
4. No response from LE

7.2.3.10. FRC-TRM-OOS (Force TRM Out of Service)

Description :

This command will be used to put AN interface subscribers out of service forcefully.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

            FRC-TRM-OOS          FORCE TERMINAL OUT OF SERVICE

L3 ADDRESS                :
```

Note : Range of L3 addresses can be given.

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

            frc-trml-oos          FORCE TRM OUT OF SERVICE

L3-ADDRESS                :

RESPONSE                  :       Success/failure

_____________________________________________________________________

256 Port 01/01/2000, Saturday 02:40:11 MORE STATUS : # HELP : ?
```

Note: *If response is failure then reason of failure will be displayed.*

Failure Reasons:

1. Invalid L3 address
2. Port is unequipped.

7.2.3.11. INIT-SYS (INITIALISING SYSTEM)

Description :

This command is used to initialize ANRAX to either last stored values or default values.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

                    INIT-SYS        REEBOOTING ANRAX SYSTEM


    BOOT LEVEL                  :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                    INIT-SYS        REBOOTING ANRAX SYSTEM


    RESULT                  : SUCCESS
```

7.2.3.12. MOD-CDT-CHAR (Modify CDT Characteristics)

Description :

This command is given to specify the start time and ports on which calendar Driven Test is to be run.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

    MOD-CDT-CHAR  MODIFY CDT CHARACTERISTICS

    EXISTING VALUES:

    CDT START TIME          : 01:25

    FIRST PORT              : 0

    LAST PORT               : 7

    MODIFIED VALUES:

    CDT START TIME          :

    FIRST PORT              :

    LAST PORT               :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

            MOD-CDT-CHAR        MODIFY CDT CHARACTERISTICS

    RESULT          : SUCCESSFUL
```

7.2.3.13. MOD-CDT-STATE (Modify Calendar Driven Test State)

Description :

This command is used to enable or disable calendar driven test.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

    MOD-CDT-STATE          MODIFY CALENDER DRIVEN TEST STATE


    EXISTING VALUES :

    CDT STATE              :        0

    MODIFIED VALUES :

    CDT STATE              :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

        MOD-CDT-STATE      MODIFY CALENDER DRIVEN TEST STATE


    RESULT             : Successful
```

7.2.3.14. PUT-DTK-INS (Put Trunk in Service)

Description :

This command will be used to put an AI link in service.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

            PUT-DTK-INS      PUT DIGITAL TRUNK IN SERVICE

V5 LINK                :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>


                        PUT LINK IN SERVICE REPORT


RESULT                 :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 03:13:29 MORE STATUS : # HELP : ?
```

Failure Reasons:

1. Invalid V5 Link ID
2. Interface down
3. Time out. No response from LE.

7.2.3.15. PUT-DTK-OOS (Put Trunk Out of Service)

Description :

This command will be used to put an AI link out of service.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

              PUT-DTK-OOS      PUT DIGITAL TRUNK OUT OF SERVICE

V5 LINK                :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        PUT LINK OUT OF SERVICE RESPONSE

LINK ID                :
RESULT                 :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 03:18:24 MORE STATUS : # HELP : ?
```

Failure Reasons:

1. Invalid V5 Link ID.
2. Link is already blocked
3. Time out no response from LE.

7.2.3.16. PUT-TRM-INS (Put TRM in Service)

Description:

This command is used to put AN subscribers in service, after testing the port.

Input Form:

```
C-DOT AN-RAX                                                    <Site id>

            PUT-TRM-INS          PUT TERMINAL IN SERVICE


L3 ADDRESS                :
```

Note :

This command does not accept Range of L3 Address

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

            PUT TRM IN SERVICE          PUT TERMINAL IN SERVICE

L3-ADDRESS          :

RESPONSE            :       SUCCESS/FAILURE
```

Failure Reasons:

1. Invalid L3 address.
2. Port is unequipped
3. Interface down
4. Exchange side test failed.
5. Time out no response from LE.

7.2.3.17. PUT-TRM-OOS (PUT TRM Out of Service)

Description:

This command is used to put AN subscribers out of service.

Input Form:

```
C-DOT AN-RAX                                                    <Site id>

        PUT-TRM-OOS          PUT TERMINAL OUT OF  SERVICE

L3 ADDRESS          :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

          PUT-TRM-OOS                  PUT TERMINAL OUT OF SERVICE:

L3-ADDRESS                :
RESPONSE                  :        FAILURE/SUCCESS

_____________________________________________________________________

256 Port 01/01/2000, Saturday 02:31:09 MORE STATUS : # HELP : ?
```

Note : *If the response is "failure" The reason because of which the command failed will be displayed.*

Failure Reasons:

1. *Invalid L3 adress.*
2. *Port is busy*
3. *Port is unequipped*
4. *Interface down*
5. *Command execution timed out.*

7.2.3.18. SWITCH-OVER (COPY SWITCH OVER)

Description :

This command is used for manually changing the standby copy to active and vice-versa.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>


Executing……
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                        PLANE SWITCH OVER REPORT

    RESULT                  : SUCCESS
```

Note : *This screen will be displayed for few milliseconds only.*

Failure Reasons:

1. Other Plane is not stand by.
2. Database not ready in stand by.
3. Stand by could not take over.
4. Time out occurred.

7.2.3.19. TST-ABORT

Description :

This command is used to abort & display result of closed loop test.

Input Form : Nore

Output Form :

Following is the output report displayed after successful execution of command.

C-DOT AN-RAX <Site id>

CLOSED LOOP TEST RESULT OF PORT

AGGREATE RESULT	:
LOOP CURRENT VALUE	:
LOOP RESISTANCE	:
MAKE DURATION	:
BREAK DURATION	:
BREAK MAKE RATIO	:
IMPULSE SPEED	:
NUMBER OF PULSE RECIEVED	:

Failure Reasons:

1. Error: No test is running.

7.2.3.20. TST-DTK (To Test a Digital Trunk)

Description :

This command will test the Digital trunk status.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

          Tst-Dtk      Test Digital Trunk


LINK ID                :
```

Output Form :

Following is the output report displayed after successful execution of command.

```
C-DOT AN-RAX                                                    <Site id>

                          TEST DIGITAL TRUNK REPORT


RESULT                 :

REASON                 :

_____________________________________________________________________

256 Port 01/01/2000, Saturday 19:31:12 MORE STATUS : # HELP : ?
```

Note :

1. *The result could be either SUCCESS OR FAILURE.*
2. *The reason field will be displayed only if the result is failure, the reason for failure could be "LINK IS INSERVICE STATE" OR "INVALID V5 LINK ID".*

7.2.3.21. TST-TRM (To Test Terminal)

Description :

This command is used to perform operator initiated tests on ports.

Input Form :

```
C-DOT AN-RAX                                                    <Site id>

                          Tst-Trm    Test Terminal

L3 ADDRESS                :

Test Number               :
```

There are tests conducted to detect line conditions, internal and external failure. The various tests conducted are listed below :

TEST SET	TESTS
102	Line Side tests
103	Closed Loop Test
101	Exchange side tests

Output Form :

Following is the output report displayed after successful execution of the command.

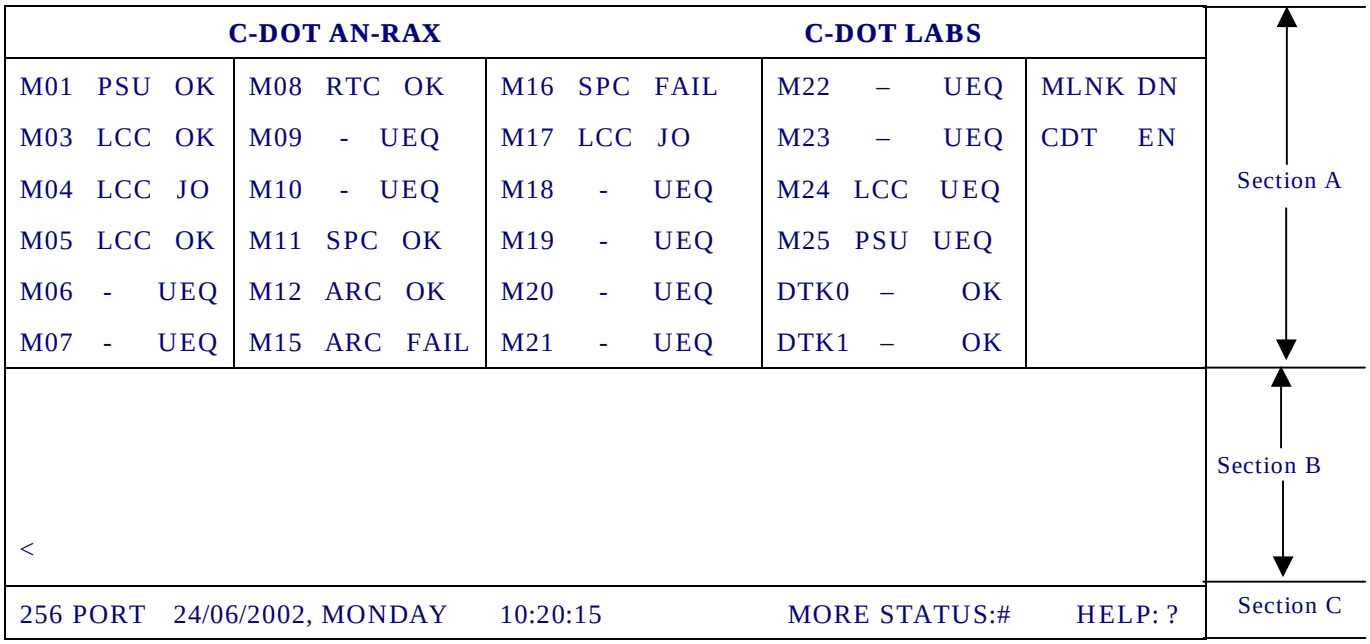
```
C-DOT AN-RAX                                                    <Site id>

                          RESPONSE TO TEST TRM
```

Chapter 8.

Alarm Monitoring

8.1. THE STATUS INDICATION AND ALARMS DISPLAY PANEL

The user display screen is divided into three sections. Section A is alarm display panel, Section B is the Area for execution of user commands & Section C is the status line.



By pressing '#' key followed by enter, the panel is toggled between Master and Slave frame. M01 to M25 or S01 to S25 displays status of different slots. Three columns are associated with each card status display. First column is slot No. second column is card type & third column is status of the card in that slot.

8.1.1. M01, M25, S01, S25

These slots are for PSU cards.

Possible status for PSU cards areOK, PSUERR & BATLO

8.1.2. M03 to M10, M17 to M24, S03 to S10, S17 to S24

These slots are for LCC/CCM card.

Possible status for these slots can be OK, JO, UEQ.

8.1.3. M08 is for LCC/CCM/RTC

Possible status for this slot is OK, JO, UEQ, FAIL.

8.1.4. M11, M16, S11, S16

These slots are for SPC Card.

Possible status for these slots can be OK, FOOS and FAIL.

8.1.5. M12, M15

These slots are for ARC card.

Possible status for these slot can be OK, ACT, SBY, FAIL, FOOS.

8.1.6. S12, S15

These slots are for ARI card.

Possible status for these slot can be OK, FAIL, FOOS.

8.1.7. DTK0, DTK1

Possible status for these can be OK, FOOS, FAIL, BLKED.

8.1.8. MLNK

Possible status can be DN, UP.

8.1.9. CDT

Possible status can be EN, DIS, ONG.

Chapter 9.

Data Creation in Local Exchange (LE)

There are basically different type of technologies used as local exchange (LE) in BSNL network . An RAX has been tested successfully with technologies like EWSD,OCB,5ESS and C-DOT. To facilitate the BSNL staff for connecting AN-RAX with above mentioned LEs, following are the commands and their parameters used in corresponding LE.

9.1. C-DOT AS LOCAL EXCHANGE

Procedure for equipping VU and creating AN-Interface at C-DOT MAX

If the VU has not been equipped then first equip VU by following process. The software version should be either 2_2_1_3 or 2_2_1_4 (all patches). It is not support in 2_1_1_1 link.

9.1.1. Equip the VU frame by using the command EQUIP-FRAME with the following parameters;

MOD-NO = BM number

RACK-NO =

FRAME NO = Depending on the frame to be equipped.

TIC-ID = TIC ID of the frame to be equipped.

FRAME TYPE = VU

9.1.2. Equip PHCs in the slots in which SHM card are Physically Present.

Use the command EQUIP-TRML-CARD with the following parameters;

HW-TYP = PHC

VER –NO = 1

CARD-SLOT = BM-rack-frame-slot,
where slot=7/8/9/10 and 17/18/19/20
Depending on the slot position of phc

Note: The command will be rejected if VU is not already equipped in the switch.

9.1.3. Initialize VU

Use the command PUT-SWU-INS with the following parameters;

MOD-NO = BM Number in which VU is equipped

UNIT –ID =TIC ID of the VU

With the corresponding TIC becoming INS-ACT , the VU gets the path to the APC ,critical alarm will now be raised for VU on the ADP.

After successful code and patch loading VU comes up and unit status of VPC, VMU-0, VMU-1 is shown as IN SERVICE and VPC-1 as INS-SBY in DISPL-SYS-ALL command of the BM

9.1.4. Equip DTS card in DTU frame by the command equip-trml-card, using following parameters

HW-TYP = DTK-CCS

VER-NO = 1

CARD-SLOT = BM-rack-frame-slot, depending on the slot where card is to be Equipped.

9.1.5. Now Create Access Network Interface (AI) by using command cre-ai with following parameters;

AI-NUM * = AN Interface Number (1-100)

AI-NAME = Interface Name

AI-TYP = V5.2

VAR-ID * = (Maximum value 127)

AI-CTG = 1

ST-L3ADR = 0

AI-LNK = (PCM-ID1)-0 & (PCM-ID2)-1

PRI-LNK = 0

SEC-LNK = 1

PROT-INF = 4 (ACCL-PORT-ALIGN)

Note :-

* The value should be same as defined at AN side ST-L3ADR preferred to be define as 0

9.1.6. Creation of Subscriber is to be done by using command cre-sub using following parameters:

```
DIRNO          :
[TEN]          :   NONE
[AISUB-ID] *   :   (AI-NUM)-(L3ADR )    eg : 1-0
[CHNL-NO]      :   NONE
[LIN-TYP]      :   ORD-LIN
[INS-TYP]      :   DECAD
[SUB-PRI]      :   1
[CAL-MOD]      :   NO-INT
[ORG-REG]      :   NO-ORG
[TRM-REG]      :   NO-TRM
[MTR-CLS]      :   NRM-MTR
[DET-BLG]      :   ORD-BLG
[ACC-BAR]      :   INCMNG_NOT_BAR-OG_UPTO_LCL-
                   ALL_BS
[LIN-CAT]      :   1
[SUB-CTG]      :   1
[CAB-ID]       :   1-1-1
[OPR-ACC]      :
[BS]           :   BS12
[B-SELECT]     :   SEQ
[CHNL-BS]      :   1-ALL_BS
[CALL-BS]      :   1-ALL_BS
[ACS-OPT]      :   NRML
```

Note: All the parameters are to be defined same as in case of ordinary subscriber.

accept **AI-SUBID**
TEN= None

9.1.7. The status of AN subscribers, AI channels and PHC terminals can be seen by using DISPL-TRM-STATUS command by using following parameters.

```
[STAT-TRM]   : ALL
TML-TYP      :
[TEN]        :
[DIRNO]      :
```

Note: Ten value is to be given when TML-TYP = AICHNL/PHC and DIRNO is to be given for **TML-TYP = ANSUB.**

9.2. EWSD AS LOCAL EXCHANGE

Testing of AN-RAX done with EWSD as LE at Karol Bagh exchange, New Delhi. Following are the commands and their details which are used in EWSD exchange. The patch used for V11 version is CJ144 and for version V13 is CJ145.

9.2.1. CREATION OF INTERFACE :

>CR V5IF

V5IF = interface number

V5IFID = interface ID

IFTYPE = V52

PROVAR = this should be same as variant ID at AN side

V5PORTS = total number of ports

9.2.2. CREATION OF V5 LINKS

>CRV5LINK

V5IF = interface number

V5LINK =0-13-0 (first zero is sort of BM no. 13 is LTG no.,and last zero is PCM no.)

V5LINKID =it is logical number given to the PCM (say 0)

This command has to be given for standby link also. It is to be noted that the standby link cannot be of same LTG (13 in this case). In one LTG maximum of four PCM can be configured.

9.2.3. MODIFICATION OF TIME SLOT

>MODV5TS

V5IF = interface number

V5LINKID =0

V5TS =16

USAG =CCH

PROTGRP =1

(PROTECTION GROUP=2 is used when TS15 Is used as communication channel.)

this command is given for both the links

9.2.4. CREATION OF V5 COMMUNICATION CHANNEL

>CRV5CMCHAN

V5IF = interface number

V5LINKID =0 (only primary link)

V5TS =16

V5CHANID =0

9.2.5. CREATION OF V5 COMMUNICATION PATH

>CRV5CMPATH

V5IF = interface number

V5CHANID =0

V5PATHID =0

PATHTYPE =CNT

Now this command is given four times for all the protocols as the pathtype

That is V5PATHID=1 : PATHTYPE =LCNT

V5PATHID=2 : PATHTYPE =BCC

V5PATHID=3 : PATHTYPE =PSTN

This means that all the protocol of V5 will travel on TS 16 of V5CHANID 0, physically on 0-13-0.

9.2.6. PARAMETER TO DISABLE CRC:

>ENTER PDCCHR

The parameter **FORMAT** in this command should be set as **STDFRM** to disable the CRC.

9.2.7. CONFIGURATION OF V5 LINK

After creation of V5link, its status has to be made active by this command.

>CONFV5LINK

V5IF =interface number

V5LINKID =0

STATUS =MBL, ACT;

That means status is first made MBL (like OOS) and then ACT. This command is run for both the link, forV5LINKID=1 also.

9.2.8. DISPLAY/STATUS COMMANDS

DISPV5IF = displays the data created for interface

DISPV5PORTS = displays the data created for subscriber

STATLTG = status of line trunk group is shown

STATV5PORT = status of subscriber is shown

DISPV5TS =data created for v5 time slot

STATV5LINK = status of v5 link is given (ACT, MBL, NAC, UNA)

EWSD STATUS	EQUIVALENT CDOT STATUS
ACT	INS-NRM
MBL	OOS-OPR
NAC	OOS-SUS
UNA	OOS-SE

9.2.9. CREATION OF AN SUBSCRIBER

>CRSUB

LAC = local area code

DN = directory number

EQN* = equipment no.(10-0-0-1)

COSDAT = V5ACCID-1

CAT = category

LNATT
ORIG1

ORIG2

The fields of equipment no (EQN):

First field = 10 (V5IFID)

Second field =0 (fixed)

Third field = two bits

Fourth field = two bits (0-99)

If fourth bit is 0 then start L3ADDR at AN side will be 0.the range of fourth bit goes up to 99.if L3ADDR is200 then EQN no. will be 10-0-2-00.if L3ADDR is 489 then its EQN no. will be 10-0-4-89. Also note that the second field of parameter COSDAT should be same as L3ADDR of equipment no. if EQN no is 10-0-5-43 then its COSDAT will be V5ACCID-543.

Also note that whenever a subscriber is created its status goes to PLA. This status has to be changed by following command.

CONFV5PORT

By this command the status of subscriber is changed to MBL and then to ACT. Check the status of the port which is made active by command STATV5PORT. Its status should be DIDLE.

9.3. 5ESS AS LOCAL EXCHAGNE

The testing of AN RAX is done with 5ESS having software version 13.1 and patch S48.

9.3.1. CREATION OF AN INTERFACE

Form 4.5 is used for creation of V5.2 interface. The command used to display the parameters of the interface is **" rddb-v5itf:v5identifier=100: "** here 100 is set as interface ID in AN-RAX.

V5 IDENTIFIER : 00100

V5 EXTERNAL IDENTIFIER : 100

V5 VERSION : V5.2

V5 PROFILE NAME : CDOT-AN

V5 ACTIVE VARIANT : 0

V5 NEXT VARIANT : 0

PSIG LCC : 0

BC USAGE : 00000000000000000000000000000000000000000

L1 RECOVERY MODE : DELAYED

REMARKS : CDOT-AN

NEW SUB PROV CADN : Y

MAXIMUM ALRM LEVEL : CRITICAL

LINKS

HOST FACILITY ID TYP C1LSCN C1LCC C2LCN C2LCC C3LCN C3LCC

1. D 011000190 0 P 000120 0 -------- ---- ------ ------

2. D 011000191 1 S 000124 ----- ------ ----- ------ -----

NOTE :

V5 IDENTIFIER parameter set above should be same as interface ID set at AN. V5 ACTIVE VARIANT and V5 NEXT VARIANT should be same as variant ID at AN side.

FACILITY = 011000190, here 11 is SM number, 0 is DLTU, 19 is DFY, 0 is facility number. The ID set as 0 and 1 for primary (P) and secondary (S) respectively, should be same as logical ID set at AN side for primary and secondary link . In above example ID for primary link is 0 and for secondry link is 1.

9.3.2. CREATION OF V5 LINK

Form 9.2 is used for data creation of V5 links. The name of this form is EPDLT, parameters for the same are as follows :

SM : 11

DLTU : 0

DFY : 19

FAC IND : 3

TYPE : V5

FACO MODE : CCS

Note: CRC should be deactivated at LE side. It can be achieved by Modifying the parameters “ESCM=CMFAS” in form 9.10. Make sure that this Parameter should not be CMCRC.

9.3.3. MAINTANANCE COMMANDS FOR V5 LINKS

- To check the status of links :

< 1124,0,11

here 0 is the dltu number and 11 is the SM number.

- To check the links used in V5 interface:

<oplst-v5lk:v5id=100;

LINK ID LINKTYPE FACILITY STATUS

0 PRIM FAS=11-0-19-0 IS

1 SEC FAS=11-0-19-1 IS

- To check the status of interface:

<lst-v5cc:v5id=100;

LINKID	CC	ACTIVE/STANDBY	LCC	TIME SLOT	STATUS
0	C1	STANDBY		DEN=11-0-19-16	OPERATIONAL
1	C1	ACTIVE	0	DEN=11-0-19-48	OPERATIONAL

- To make the link out of service:

<rmv-fac:11-0-19-0;

- To make the link inservice:

<rst-fac:11-0-19-0;

- To check the status of interface:

<opst-v5if:id=100;

- To check the datacreation for subscriber;

9.3.4. CREATION OF AN SUBSCRIBER

<rddb-sbldn:dirnr=7911133

DIR NR : 7911133

QUANTITY :.....

LN EQ NR : V 00100P00000

(In case of 5ESS start L3 Addr = 1)

Here, in LN EQ NR ,100 is interface ID and 00000 is the L3 ADDR.The LN EQ NR for next L3 ADDR will be V 00100P00001. All other parametrs of this command will be as per LE requirement.

To check the status of AN subscriber :

9.3.5. MAINTANANCE COMMANDS FOR AN SUBSCRIBER

<opst-sub:7911133;

The normal status is " IS AUTO "

To make the subscriber out of service :

<rmv-sub:7911133;

To make the subscriber in service:

<rst-sub:7911133;

9.4. OCB AS LOCAL EXCHANGE

The testing of AN interface has been done with OCB exchange having software version R23 and R24.

9.4.1. V52 UR Creation

Command : V52CR

Parameters: AFUR, AF, ID, VERS, VAR, TYPM, SEEF

- AFUR - Functional address for V52 connection unit (internal logical identification) [**used '200' Jabalpur**]
- AF - Functional address of AN (ANAi/ANBi)
- *ID - Interface identifier between 0 & 16777215) [**INTERFACE ID**]
- VERS: AN version (0 to 255). This is to adapt the management of a V5.2 interface, in the OCB283, to the AN network. [**Recommended value for C-DOT is '4', default is '0']**
- *VAR: VAR: Interface variant, defined jointly, which characterises the interface configuration. (0 to 127, Default is 0). [**VARIENT ID.]**
- TYPM: Type (capacity) of AN.
- TYPM='V52AN01'- 1024 subscribers **[FOR AN-RAX]**
- TYPM='V52AN02' - 4096 subscribers
- TYPM='V52AN03' - 8192 subscribers

SEEF: Call completion ratio threshold for alarm generation **[PUT '25']**

AT IDGAH OCB-283 VER R24

AFUR=052; AF=ANA01; TYPM=V52AN01; ID=3; VAR=0; VERS=4; SEEF25

9.4.2. PCM Creation

Command: MICCR

Parameters: AFLR, AMET, ID, TYMIC

- AFLR: Functional address in the form UR-PCM.
- AMET: Physical address of the PCM in the SMT
- TYMIC: MIC2G (Default value) for SMT2G.

AT IDGAH OCB-283 VER R24

FOR PCM'0' AFLR-52-0; AMET=2-5-3; ID=0; TYMIC=MIC2G

FOR PCM'1' AFLR=52-1; AMET=1-18-1; ID=1; TYMIC=MIC2G

Note: The CRC should be deactivated. This can be checked by displaying the parameter correction “CRC” through command “Q2MCMIL”.

AFLR = <>

CRC = NACT

9.4.3. Creation of Communication Channel

Command: CCHCR

Parameters: AFCC, AFVT, GP, ACT.

- *AFCC: Communication Channel number in the form of UR no-CC no.
- *AFVT: UR no.-LR no.-TS no. (Value=say, 100-0-16)
- *GP: Protection group number. (1 or 2)
- *ACT: Type of CC (YES or NO)

AT IDGAH OCB-283 VER R24

FOR PCM'0' ACT=YES; AFCC=52-0; AFVT=52-0-16; GP=1

FOR PCM'1' ACT=NO; AFCC=52-1; AFVT=52-1-16; GP=1

9.4.4. Creation of Communication Path

Command: CPHCR

Parameters: CP, AFCC, TYCP

- *CP: Communication path number. (0 and 127)
- *AFCC: Number of the associated CC.
- TYCP: Type of CP. (PSTN for analog lines and ISDNS for digital lines.)

(UR can be made in service by TELEMO at the end of this creation).

AT IDGAH OCB-283 VER R24

AFCC=52-0;CP=0; TYCP=PSTN

9.4.5. Creation of Subscriber

Command: ABOCR

Parameters: ND, NE, TY, CAT, NAP, CP

- *ND: Directory Number
- NE: Equipment no. in the form of UR-REG-BRO.

- TY: Type of line. value V52 is mandatory.
- CAT: Category of the line.
- *NAP: Number of access port defined jointly in the LE and the AN. The value is in the range from 0 to 8175 for ISDN lines and 0 to 32767 for analog lines.
- *CP: CP to which the line is attached. (digital accesses only).

AT IDGAH OCB-283 VER R24

ND=3592000; TY=V52+KLA+SR1; CAT=IAI; AFUR=52; NAP=0

ND=3592001; TY=V52+KLA+SR1; CAT=IAI; AFUR=52; NAP=1

Appendix - A

Glossary

AN	:	Access Network
CAS	:	Channel Associated Signalling
CCS	:	Common Channel Signalling
CEPT	:	European Conference of Posts and Telecommunications Administration
CP	:	Call Processing
DLE	:	Data Link Entity
DMA	:	Direct Memory Access
DTMF	:	Dual Tone Multi Frequency
FSM	:	Finite State Machine
HDLC	:	High level Data Link Control
LE	:	Local Exchange
LTE	:	Line Termination Equipment
MAX	:	Main Automatic Exchange
ARC	:	AN-RAX Controller Card
ARI	:	AN-RAX Interface Card
MDF	:	Main Distribution Frame
LCC/CCM/ CCB	:	Subscriber Line Card
MMI	:	Man Machine Interface
PSU	:	Power Supply Unit
RTC	:	RAX Terminal Tester Card

PCM	:	Pulse Code Modulation
POTS	:	Plain Old Telephone Services
PSTN	:	Public Switched Telephone Network
AN-RAX	:	Access Network - RAX
RSU	:	Remote Switch Unit
V5	:	Standard interface between LE and AN

Appendix - B

Maintenance Procedures

B1. AN-RAX has a definite maintenance philosophy. The maintenance software maintains status table of all ports and DTKs.

B2. The different status of ports maintained are :-

INS	:	Port is FREE and calls can be made
FOOS	:	Made out of service by An operator or by Maintenance software upon detection of Line card absence after a Jackout.
OOS/MTCE	:	Made out of Service by system Maintenance due to hardware fault, or because the line card has been jacked out.
BLKED	:	Made OOS by LE. The port comes INS-FREE when unblocking is initiated or agreed by LE.

Note : TST-TRM can be performed on ports in OOS/FOOS/MTCE states only.

B3. The DTK can assume the following statuses :

FOOS	:	Blocked by operator from the AN-RAX console. The link will be looped back so will be physically disconnected from LE.
FAIL	:	When the digital trunk has some physical level problem (out side AN-RAX) and no Frame Alignment Signal is detected.
BLKED	:	Blocked by LE.
INS/OK	:	In service normal

Note: *For testing of DTK, the provisioned DTK has to be first put FOOS before testing.*

B4. The Equipment like Line Cards, Controller cards and Power Supply cards have the following statues:

FOOS	:	The card status cannot be obtained because of the corresponding controller card is out of service.
FAIL	:	The controller card or SPC/RTC card is faulty or not responding.
JO	:	The line card is jacked out
OK	:	The card is In-service.
ACT	:	The controller card is currently active
SBY	:	The controller card is hot standby, ready to switchover.

UEQ	:	The termination card is not equipped.
PSUER	:	The output of PSU card to other cards is not ok
BATLO	:	The input to PSU card is not ok

B4. a) When two E1 links are present and both are, made FOOS using operator commands `Put-dtk-oos' or `frc-dtk-oos', the command `Start-ai' has to be given after `put-dtk-ins' command to restart the V5 interface.

b) When only one E1 link is present and is made FOOS using operator commands `put-dtk-oos' the command `start-ai' has to be given after `put-dtk-ins' to restart the V5 interface.

Appendix - C

AN-RAX System Conversion Procedure

The following steps give a brief guideline for converting an existing RAX to AN-RAX

Before switching off 256P RAX :

1. Take printout of "port to dir" number mapping.
2. Take printout of STD/ISD & CCB subscriber details.
3. Take meter reading for all subscriber & exchange meter reading. (just before switching the RAX off finally).
4. Use stickers or some other mean to individually mark each and every card present in RAX according to its position.
5. Remove the screws that hold the Master & Slave frame to the RAX box.
6. Mark cables terminated at various cards, if they are not already marked.
7. Terminate the DT Cable at Optical Mux and secure it to the Master frame slot 12/15 using cable ties (see details 6.4.2).
8. Secure the cable for Dumb terminal with cable ties. Terminate it to the Dumb-terminal (see details 6.4.3)
9. Cut & strip the straps for both the motherboards make sure you have a few spares for each of the straps.
10. Connect extended latches to each of the four module latching frames.

After switching off the 256P RAX :-

1. Remove the main cut-out from the fuse-panel.
2. Jack out all the cards
3. Remove all the cables from behind.
4. Remove frames one by one. Remove shrouds and keep the nuts, bolts & washers in a safe place from slot 12 & 15.
5. Make all the straps as per 6.3.1.
6. Buzz the straps with multimeter to check proper link between pins.

7. Replace the shrouds and put on the prechange pins on one side as given in 6.3.2 & 6.3.3.

8. Put new shrouds with one pre-change pin as given in 6.3.2 & 6.3.3.

9. Place the frames back in the cabinet.

10. Connect the 7x2 cables as per Connection given :-

Sl. No.	Cable Marker No.	Source Connector Position	Destination Connector Position	Cable Description
1.	IFC0	Master Frame 12A, Pos-II	Slave Frame 12A, Pos-II	Twist & flat ribbon cable 7 pair
2.	IFC1	Master Frame 12A, Pos-I	Slave Frame 12A, Pos-I	- do -
3.	IFC2	Master Frame 15A, Pos-II	Slave Frame 15A, Pos-II	- do -
4.	IFC3	Master Frame 15A, Pos-I	Slave Frame 15A, Pos-I	- do -
5.	IFC4	Master Frame 2B, Pos-I	Slave Frame 2B, Pos-I	- do -

11. Connect the cable for Dumb terminal as per connection given

Sl. No.	Cable Marker No.	Source Connector Position	Type	Destination Connector Position	Type
1.	MOD2 MOD1	Master Frame 2A, Pos-I and 12B, Pos-III	7 x 2 Single Module Connector	Dumb Terminal RS 232-Connector Marker SDT0	25P D-Type Connector

12. Connect the cable for the digital links as per connection given

Sl. No.	Cable Marker No.	Source Connector Position	Type	Destination Connector Position	Type
1.	DTC1	Master Frame 12B, Pos-I	7 x 2 Single Module Connector	Digital Distribution Frame (DDF)	Bare wire

13. Remove the PSU(s) present and replace EPROM [only valid if PSU version is A09] if Distinctive Ringing feature is required. Put back the PSU cards.

14. Jack in the cards cards ARC in slot 12 & 15 of Master frame & ARI in slot 12 & 15 of slave frame.

15. Jack in the SPC/ISP cards in slot 11 & 16 of both the frame.

16. Jack in RTC card in slot 8 of master frame

17. Jack in LCC/CCM card as per configuration in other line card slots

18. Connect the following cables between ARC & ARI cards in front.

Sl. No.	Cable Marker No.	Source Connector Position	Destination Connector Position
1.	ACI0	ARC Front Master Frame slot 12	ARI Front Slave Frame slot 12
2.	ACI1	ARC Front Master Frame slot 12	ARI Front Slave Frame slot 15

19. Switch on all the PSUs of AN-RAX.

20. Connect 220V, 50Hz input to the Dumb Terminal and switch it on. The symbol of C-DOT along with Password screen will be displayed.

Note: Before switching on the dumb terminal it should be well checked that the earthing of the AC Main Supply and AN-RAX have been properly done.

21. The default password is '87654321'

22. On the command prompt give the following command

init-sys ↵
BOOT LEVEL : 2 ↵

23. **Since in default data LCC are equipped in all line card slots of the master and slave.**

To equip CCM/CCB in their respected slots give the following commands:

1.) unequip-slot ↵
Frame : < 1-master or 2-slave > ↵
Slot : < range 3-10 or 17-24 > ↵

2.) equip-slot↵
Frame : < 1-master or 2-slave > ↵
Slot : < range 3-10 or 17-24 > ↵
Card Type : <CCM/CCB> ↵

In default data all subscribers are INS.

24. Give command to delete default AN interface

del-ai ↵

25. Give the command to create a V5 interface.

Cre-ai↵

V5 interface id : <same as given at LE> ↵

V5 interface name : <site-name> ↵

Variant id : <same as given at LE> ↵

Starting L3 Address : <same as given at LE> ↵

Number of ports	:	<same as given at LE> or max value of 256 ↵
Link Configuration	:	0 - <NOTE1> & 1 - <NOTE2> ↵
Primary link	:	<NOTE1> ↵
Secondary link	:	<NOTE1> ↵

Note 1 : *Logical link id (range 0 - 255) same as that specified at LE for primary link. It should be the id of Digital E1 link patched to Blue-White & Orange-White pairs of cable Marker - DTC0.*

Note 2 : *Logical link id (range 0 - 255) same as that specified at LE for secondary link. It should be the id of Digital E1 link patched to Green-White & Brown-White pairs of cable Marker - DTC0.*

26. After creating data at ANRAX, issue the command to start V5 interface.

    start-ai ↵

    Note: *It is being assumed that the data creation exercise has been completed at LE.*

27. After successful initialisation of V5 interface the command 'displ-ai-status' will show the status

V5L1 Link Status	:	ACT/SBY
V5L2 Link Status	:	ACT/SBY
V5 Interface Status	:	OPERATIONAL

28. All the AN subscribers which are created at LE will get dial-tone after few minutes.

29. After successful V5 interface initialization give the following command to display the subscriber status:

    displ-trm-status ↵

    L3-Address : <Starting L3 Addr> - <starting L3 Addr + no. of ports>↵

The following extra material and equipment should be made available at the site for ease of upgradation :-

1. A small screwdriver. Thin head
2. A small tweezer. To hold prechange pins & nuts.
3. A printer with printer cable & power card. (For meter reading of RAX)

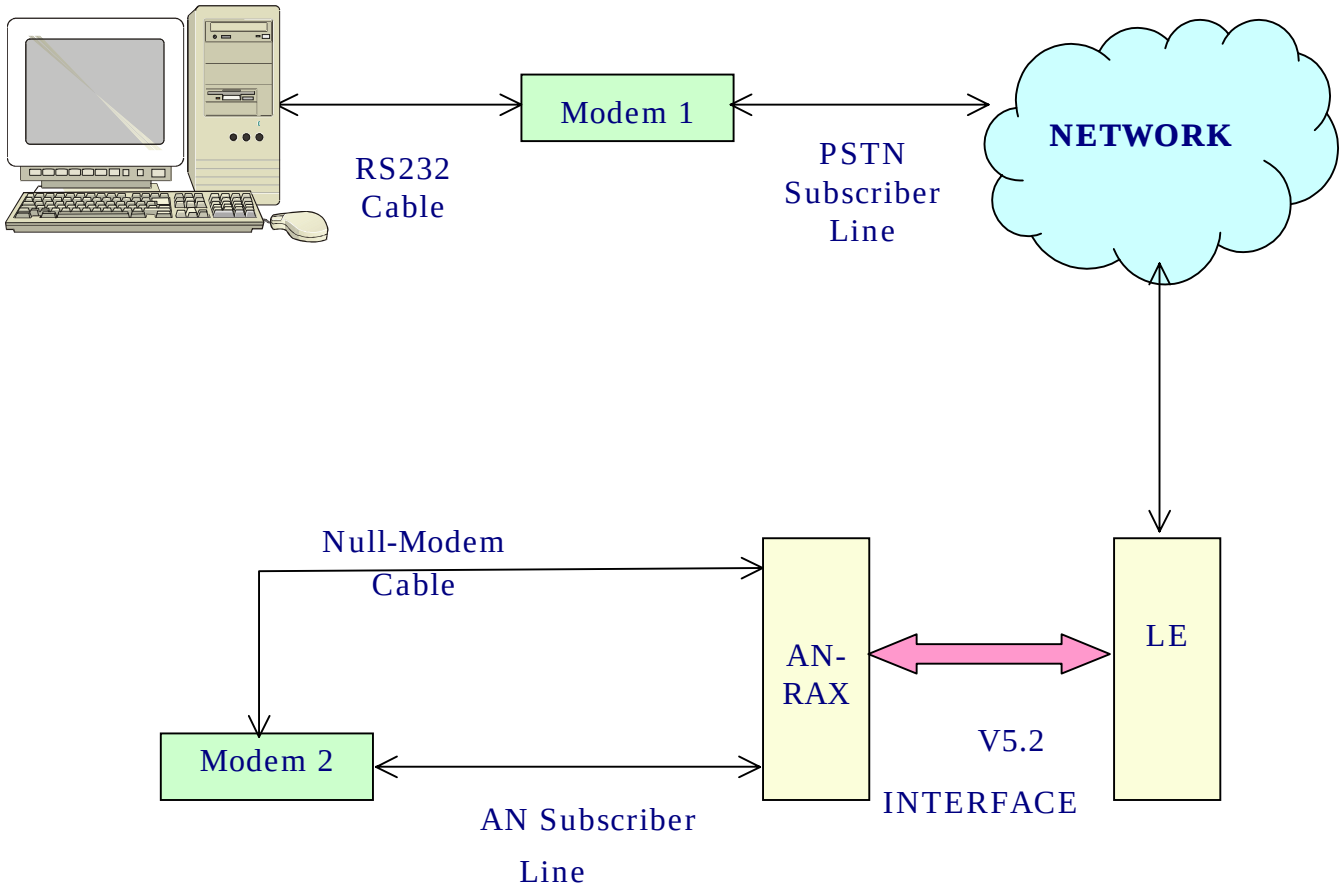
4. Multimeter
5. LEDs (to check E1)
6. Screwdriver set
7. A spanner (10-11 size)
8. Some fuses of multiple values (for filter boxes)
9. Nose-plier

Note: If AN-RAX is operational then in order to unequip any slot, first all the port in that slot should be made OOS by giving command FRC-TRM-OOS and then appropriate L3 address.

Appendix - D

Remoting AN-RAX Operator Console

The ANRAX Operator console can be remoted to a centralized location using a normal PSTN dial-up connection.



The following commands are to be given to modem 1 (Remote site):

1. at&d0
2. ats0=003
3. atx1
4. at&w0&w1

The following commands are to be given to modem 2 (AN site):

1. at&d0
2. ats0=003
3. ate0
4. at&w0&w1

The pin configuration of Null – modem cable between modem 2 and ANRAX:

25 Pin D type connector modem 2	**Master Frame, 2A Pos I 7 x 2 connector**
2	c3
3	a3
4 shorted 5	
7	a7 & c7
6 8 shorted 20	

The procedure for connecting to remote ANRAX is as follows:

- Boot the PC in Windows.
- Connect modem 2 to com-port 1 or 2 of PC with RS232 cable.
- Start HyperTerminal from windows with the following settings: 9600 bps, 8 bit data, parity NONE, stop bit = 1, no flow control.
- Establish communication with modem 2 and give commands as given above for modem 2.
- Disconnect the modem 2 and place it at the ANRAX site. Connect modem 2 with ANRAX using Null-modem cable.
- Connect modem 1 to PC and establish connection.
- Give the commands to modem as shown above for modem 1.
- Connect a subscriber PSTN line to modem 1.
- Connect an ANRAX subscriber line to modem 2.
- From PC, give the following command to dial the remote ANRAX.

  atdp<ANRAX subscriber line to which modem 2 is connected>

सी-डॉट C-DOT **System Practices**	**COMMENTS**

The following comments pertain to:

Document Name ☐☐☐